Structural Monitoring
Equipment List

- when it has to be **right**

Leica Geosystems

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Overview

1 Monitoring Systems

1.1 Main Components

Each monitoring project has specific measurement and accuracy requirements. If you are going to prepare a monitoring project or plan to offer a quotation for a monitoring tender, the following five sections have to be considered:

1. PC and Software
- Robust PC with supported operating system, serial and Ethernet ports and GeoMoS, GeoMoS Web, GNSS Spider, GeoMoS HiSpeed, Spider QC or CrossCheck.

2. Sensors
- Total stations, prisms and mounting
- GNSS Sensors, antennas and mounting
- Inclination Sensors, shelters and mounting
- Meteo Sensors, mounting
- Geotechnical sensors (e.g. extensometers, piezometers, strain gauges, tiltmeters, thermometers, barometers, rain gauges, ...)
- Other Sensors

3. Communication
- Cables, radio modems, wireless modems, converters

4. Power
- Reliable power source with backup
- Direct power
- Separate units
- Solar panels

5. Miscellaneous
- Measurement hut to protect the total station and PC from the elements for example rain, sun, dust, snow
- Pillars and monumentation
- Climate control system (avoid temperature expansion, moisture, condensation and uneven heating of the instrument)
- Security
- Access (physical and remote)

1.2 Setups

Combine Leica software, geodetic, geotechnical and meteorological sensors to match the needs of your monitoring challenge. Basic examples are given in the **Setups** section to provide an idea of monitoring setups and options.

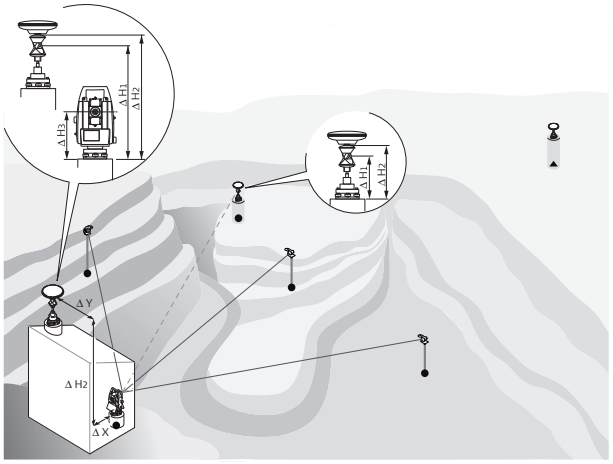
1.3 Stable Reference Points

GeoMoS is an integrated solution that supports total station, GNSS receivers, levels and geotechnical sensors for an overall understanding of structural movements.

In large monitoring projects total stations and GNSS receivers can be combined in many different ways to match the requirements and use a stable reference.

Total station with co-located GNSS sensor:

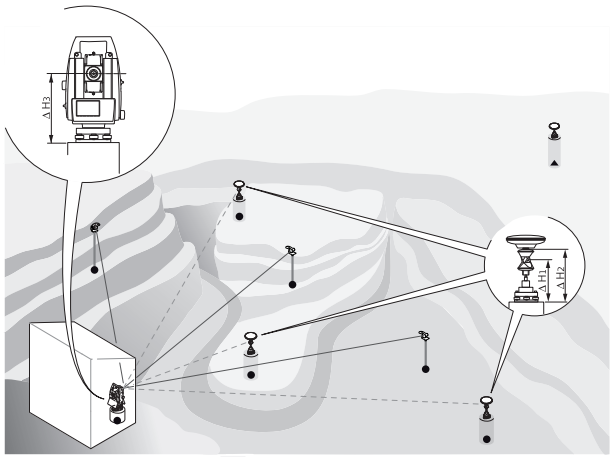
- A total station standpoint can be placed in an unstable area.
- A GNSS antenna can be mounted on the top of the measurement hut and applied to the total station standpoint with a three-dimensional offset.
- The total station orientation can be measured and calculated with an orientation to a reference point inside the unstable area.
- A GNSS antenna must be mounted on the top of the reference point prism inside the unstable area.
- The GNSS antenna results must be applied to the reference point inside the unstable area with a height offset.
- The GNSS antenna needs a reference station so that baselines can be computed.



▲ **Stable reference point**
● **Unstable monitoring point**
Δ H, Δ X, Δ Y **Offsets to be set in GeoMoS**

Reference points with co-located GNSS sensors

- A total station standpoint can be placed in an unstable area.
- The total station standpoint can be measured and calculated with a free station or distance intersection to reference points inside the unstable area.
- A GNSS antenna must be mounted on the top of the reference point prism inside the unstable area.
- The GNSS antenna results must be applied to the reference point inside the unstable area with a height offset.
- The GNSS antenna needs a reference station so that baselines can be computed.



▲ **Stable reference point**
● **Unstable monitoring point**
Δ H, Δ X, Δ Y **Offsets to be set in GeoMoS**

Reference station

- A GNSS antenna can be placed in a stable area as a reference station.
- The reference station should be as close as possible (< 3km) to the monitoring area so that the baselines can be computed with the highest accuracy.

Software

2 GeoMoS

2.1 GeoMoS Modules

774 119	**GeoMoS Monitor**
774 120	**GeoMoS Analyzer**
774 121	**GeoMoS Adjustment**
780 059	**GeoMoS Demo (1 year)**
774 328	**GeoMoS Evaluation (30 days)**

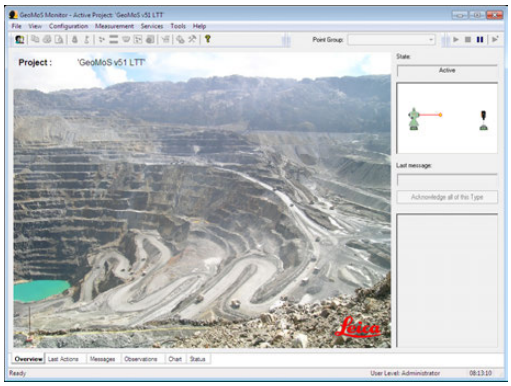
		GeoMoS Monitor	GeoMoS Analyzer	GeoMoS Adjust-ment	GeoMoS Demo (1 year)	GeoMoS Evalu-ation (30 days)
Monitor Option 1 (Computation)	774 135	○	-	-	●	●
Monitor Option 2 (Limit checks/Messaging)	774 136	○	-	-	●	●
Monitor Option 3 (Export Service for GeoMoS Adjustment)	774 137	○	-	●	-	●
Monitor Option 4 (Scanning) ☞ Only for GeoMoS Version 6.0	807 098	○	-	-	●	●
Sensor License	774 134	○	-	-	●	●
Analyzer Option 1 (TPS Post-Processing)	774 138	-	○	-	●	●
DVD-ROM included	723 367	●	●	●	●	●

● Included: automatically, not removable
○ Optional
- Not available

Upgrades / Updates

CCP	Update from GeoMoS Version 5.0, 5.1, 5.2, 5.3 to Version 6.0 (inclusive Upgrade from all Options). ☞ For more information about Customer Care Packages (CCPs) please refer to the section **CCP - Software**.
6004463	GeoMoS Upgrade Bundle. The prices for the GeoMoS Upgrade Bundles are calculated based on the included Upgrades (780 056, 780 057 and 780 058) purchased by the customer.
780 056	GeoMoS Monitor Upgrade to 6.0. Upgrade from GeoMoS Version 5.0 (and higher) to Version 6.0 (inclusive Upgrade from existing GeoMoS Options to new GeoMoS 6.0 Options). The GeoMoS Monitor Upgrade must be ordered through the GeoMoS Upgrade Bundle.
780 057	GeoMoS Analyzer Upgrade to 6.0. Upgrade from GeoMoS Version 5.0 (and higher) to Version 6.0 (inclusive Upgrade from existing GeoMoS Options to new GeoMoS 6.0 Options). The GeoMoS Analyzer Upgrade must be ordered through the GeoMoS Upgrade Bundle.
780 058	GeoMoS Adjustment Upgrade to 1.6. Upgrade from GeoMoS Adjustment Version 1.2, 1.3, and 1.5 to Version 1.6. The GeoMoS Adjustment Upgrade must be ordered through the GeoMoS Upgrade Bundle.

2.2 GeoMoS Monitor



774 119	**GeoMoS Monitor** GeoMoS Monitor is the monitoring software for the normal use of the customer. The customer can collect and store data. • Connection to sensors (serial or TCP/IP) with valid Sensor Licenses (includes the GeoCOM Robotics and GeoCOM Imaging license) • Project management • User levels • Learn points • Manual total station coordinate determination with Free Station, Distance Intersection or GNSS Update • Automatic measurements with various options • Blunder tolerance checks on raw data • Information about the current system and measurement status • Calculation of GNSS displacements and daily average results • Automatic database export • SQL Server 2005 Express database included Leica GeoMoS makes use of the Microsoft SQL database. With Leica GeoMoS the free version Microsoft SQL Server 2005 Express is provided and will be installed, if no SQL server is available.

2.3 GeoMoS Monitor Options

GeoMoS Monitor Option 1	
774 135	**Computation** • Automatic total station coordinate determination with different methods (Free Station, Distance Intersection or GNSS Update) • Calculation of any total station results including coordinates, displacements, profiles, distance reduction • Calculation of any total station correction with Free Station, Distance Intersection, Orientation, PPM and Vz Correction groups and associated point group properties • Calculation of daily average results for total stations • Computation of virtual sensors with constants, mathematical functions and/or logic operators
GeoMoS Monitor Option 2	
774 136	**Limit checks and Messaging** • Automatic computation of limit checks • Multiple levels of limit checks (yellow, orange, red) • Limit Level 1, 2 and 3 can be assigned independent actions • Four different types of limit check computation (absolute, short time, long time and regression) • Allows emails and SMS to be sent, applications to be run, the database to be queried and digital outputs to be set when defined messages are generated by the system
GeoMoS Monitor Option 3	
774 137	**Export Service for GeoMoS Adjustment** • Manual and automatic GeoMoS data export in XML format

GeoMoS Monitor Option 4	
807 098	**Scanning** • Image assisted learning of multiple scan areas • Automatic scanning • Colour coded deformation cloud on high resolution images • Deformation volume ☞ GeoMoS Scanning is supported with GeoMoS Version 6.0.

2.4 Sensor License

774 134	**Sensor License** The sensor license concept means that the software scales with the number and type of sensors you have connected. Additional sensor licenses can easily be added later should your needs change.

For each sensor you need to order a special amount of Sensor Licenses. The required amount of sensor licenses per sensor is listed below:

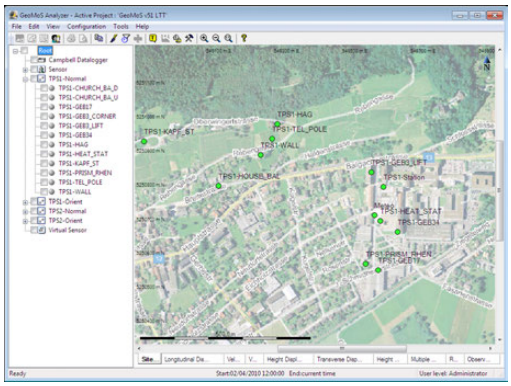
	Amount required per sensor
TPS Sensor and MultiStation	**30**
GNSS Sensor (NMEA)	**10**
Connection to a GNSS Spider Site Server with all Spider RT Positioning Products	**10**
Connection to a GNSS Spider Site Server with all Spider PP Positioning Products	**10**
Nivel200 Sensor	**3**
Digital Level	**3**
Temperature / Pressure Sensor (DTM STS)	**1**
Temperature / Pressure / Humidity (WuT)	**1**
Vaisala sensor	**3**
Geotechnical Sensor connected via Campbell Scientific Datalogger	**1**

☞ Note that each sensor requires sensor licenses even though the sensor is connected with a bus system (Nivel220) or Campbell Scientific datalogger (geotechnical sensor) to GeoMoS.

☞ For more information about connectable sensors offering with GeoMoS Monitor please contact your local Leica Geosystems organization or distribution partner.

☞ For more detailed information about Sensor Licenses please refer to the section **Licenses Examples**.

2.5 GeoMoS Analyzer



774 120	**GeoMoS Analyzer** GeoMoS Analyzer is an analysis tool that can be used to view data collected by any GeoMoS Monitor. • Graphical and numerical visualization of results • More than one installation of Analyzer may access the data and do analysis simultaneously • Project management • User levels • Outlier detection algorithm • Set results invalid/valid • Enter comments • Customizable graphics • Customizable reports with filter and search mechanism • Manual database import and export • Export to other systems e.g. ASCII, DXF and BMP • SQL Server 2005 Express database included For online analysis using GeoMoS Analyzer at a remote location there needs to be continual connection between GeoMoS Monitor and GeoMoS Analyzer computers.

2.6 GeoMoS Analyzer Options

GeoMoS Analyzer Option 1	
744 138	**TPS post processing** • Re-processing of the coordinate system, distance reduction, meteo model and all values modified in the Data Editor • Data Editor to modify additive constants, reflector heights, temperature and pressure • Re-processing of the profile directions, instrument height and null coordinate together with GeoMoS Monitor

2.7 GeoMoS Adjustment

774 121	**GeoMoS Adjustment** Leica GeoMoS Adjustment is an add-on analysis software that can be used to compute network adjustment and deformation analysis data collected by any GeoMoS Monitor. • Manual and automatic import of GeoMoS XML files • Network adjustment computation as minimal constraint network, reference points as fixed or absolute fixed • Automatic outlier detection and removal • Deformation analysis based on the two-step method • Detect stable and unstable reference points • Combination of total stations and/or GPS/GNSS • Numerical and graphical analysis of the network adjustment and deformation analysis data • Statistically qualified data with precision and reliability • Display the magnitude, precision pattern and statistically significance of movements • Display unstable reference points • Compare the results of different measurement epochs • Simulate different topological scenario for achieving the optimal network geometry, accuracy and reliability ☞ GeoMoS Monitor Option 3 is required to export data for GeoMoS Adjustment. The GeoMoS Monitor Option 3 license must be available where GeoMoS Monitor is running.
	Extended Analysis Service Consultation, training and data analysis services are available from our partner company Technet GmbH. Technet's highly qualified engineers have over 15 years of experience in high precision deformation surveys, network adjustment and deformation analysis in a wide range of projects. **One-Time Service** Adjustment Problem Solution within 24 hours per processing. **All-Time Service** Adjustment Problem Solution within 24 hours per year (10 processing's max). **Interpretation Service** Expert Interpretation and Report based on a Monitoring System Project for 2 Epochs.

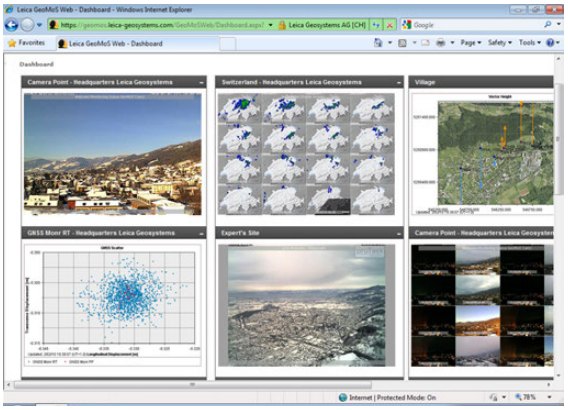
2.8 GeoMoS Demo (1 year)

780 059	**GeoMoS Demo (1 year)** GeoMoS Demo is for demonstration purposes only and is not for commercial sale. GeoMoS Demo has the same functionality as GeoMoS Monitor, GeoMoS Analyzer and GeoMoS Adjustment, but cannot be used for permanent monitoring. GeoMoS Monitor: The automatic measurement will only run for a limited time (TPS Sensor measurements = 100, geotechnical measurements = 500). GeoMoS Analyzer: All functionality included. GeoMoS Adjustment: The automatic computation will only run for a limited time (epochs = 3). The manual computation will only run for a limited number of adjustments (15 points, 55 total station measurements, 20 GNSS baselines). The design mode will only run for a limited number of points (15 points) and with XML file import. GeoMoS HiSpeed: All functionality included. ☞ GeoMoS Demo does not include GeoMoS Monitor Option 3.

2.9 GeoMoS Evaluation (30 days)

774 328	**GeoMoS Evaluation (30 days)** GeoMoS Evaluation is for demonstration purposes only and is not for commercial sale. GeoMoS Evaluation has the same functionality as GeoMoS Monitor and GeoMoS Analyzer. GeoMoS Evaluation can be used for a period of 30 days for permanent monitoring demonstration. The automatic measurement will not be stopped. The long term use of GeoMoS Evaluation will be reviewed by Monitoring Support Staff. ☞ GeoMoS Evaluation does not include Leica GeoMoS Adjustment.

2.10 GeoMoS Web



	GeoMoS Web Leica GeoMoS Web is a web based service for visualization and analysis of monitoring data collected by GeoMoS Monitor. • Easy access through standard web browsers • Graphical and visualization of monitoring data (graphs and webcam images) • Automatic reporting with PDF documents • Remove outliers from any graph • User levels (admin, viewer) • Save raw data to comma separated files • Personalized and secure data access • No need to maintain IT infrastructure and software • Physical and electronic security of data • Protection against misusage • Easy translation based on XML files • Result images from GeoMoS Scanning The Leica GeoMoS Web service is composed of:
5001892	**Setup Fee** For the initial configuration of the service. Once only.
5302475	**GeoMoS Web Quarterly Subscription Per Point** For access to the web service for a period of three months (90 days). One article is required for each monitoring point to be shown in the web. A minimum of 5 X Article 5302475 is required.
	Billing • An invoice will be sent each month or quarter for the amount of Quarterly Subscription Per Point's that were ordered. • The service is paid per billing period (month / quarter).
	Service Change Requests The amount of Quarterly Subscription Per Point's of the Leica GeoMoS Web service can be changed at a month's notice for the next billing period. An administration fee (5001893) of 200.- CHF is incurred each time the number of points is increased. It is not possible to decrease the number of points.
	Cancellation • The Leica GeoMoS Web service can be cancelled with a month's notice for the next billing period. • The cancellation notice must be given in written form.
	Customer Care Package License Leica GeoMoS Web is a service that requires no extra CCP License.
	Leica GeoMoS Web Evaluation License For existing and new Leica GeoMoS customers we offer a "Leica GeoMoS Web Evaluation License". This program offers an exclusive chance to access Leica GeoMoS Web for a 30 day trial period. Please contact your local Leica Geosystems sales representative for more detailed information.

3 Leica GNSS Spider

All active RT Positioning Products (with the "Send To" option set to GeoMoS) and PP Positioning Products configured in GNSS Spider can be used in GeoMoS. Thus many GNSS sensors maybe connected using a single entry in the GeoMoS Sensor Manager.

Positioning Site Licences are cumulative between RT and PP Positioning Products. For example, to use 10 sites simultaneously in both RT and PP Positioning Products requires 20 Positioning Site Licences. There is no limit to the number of Positioning Products (baselines) that may be configured if the number of sites used (including reference and rover sites) does not exceed the number of Positioning Site Licences.

3.1 Required Options for Real Time Monitoring (RT Positioning Products)

740 244	**Leica GNSS Spider**	GNSS Reference Station Software, general license. With documentation. Supports full receiver control and configuration, manual downloads and firmware upgrade. Not protected.
744 912		Leica GNSS Spider, Positioning Site license. Required for each GNSS site/sensor that shall be used for the Spider position processing. A minimum of two of these licenses is needed for Positioning.

3.2 Required Options for Post Processed Monitoring (PP Positioning Products)

740 244	**Leica GNSS Spider**	GNSS Reference Station Software, general license. With documentation. Supports full receiver control and configuration, manual downloads and firmware upgrade. Not protected.
744 912		Leica GNSS Spider, Positioning Site license. Required for each GNSS site/sensor that shall be used for the Spider position processing. A minimum of two of these licenses is needed for Positioning.
744 904		Leica GNSS Spider, File Products Service (FPS) option. Provides automated data download and management for multiple sites with automated RINEX conversion, quality control, event logging, FTP transfer for distributing Spider product files on the Internet. Option includes one site/sensor license. For more site/sensor licenses for a Spider FPS, order one or more Spider, FPS Additional Site License as required.
734 613		Leica GNSS Spider, FPS Additional Site License. Required for each GNSS site/sensor that shall be used with Spider File Product Service in addition to the default one site/sensor, which is included as standard.

4 Leica GeoMoS HiSpeed

Leica GeoMoS HiSpeed is a professional software tool for sophisticated and reliable deformation analysis of high rate data.

788 239	**Leica HiSpeed**	GeoMoS HiSpeed (high-speed data acquisition for NIVEL200 and GNSS sensors, Real-time data analyzes (NIVEL200, GNSS NMEA and Spider Products), display offline graphics.
788 240	**GeoMoS HiSpeed Option 1**	GeoMoS HiSpeed Option 1 ((Limit Check and Messaging, e.g. E-Mail).
	GeoMoS HiSpeed Free Version	GeoMoS HiSpeed (high-speed data acquisition for NIVEL200, Real-time data analyzes (NIVEL200).

5 Leica SpiderQC

Leica SpiderQC can be used as an alternative to GeoMoS as a high speed analyzer for use together with Leica GNSS Spider for GNSS monitoring and tilt sensors.

Required Options for Analysis of Real Time and Post Processed Positioning Data from Spider		
749 319	**Leica SpiderQC**	GNSS Reference Station software with documentation. For data analysis and quality control of GNSS reference station data. Dongle protected.
751 824		GNSS QC, Advanced Coordinate Analysis option. High speed calculation and graphing of displacement, messaging and limit checks for real time NMEA and GNSS Spider Post Processing coordinate data. Dongle protected.

6 Leica CrossCheck

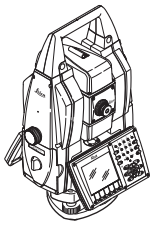
Leica CrossCheck is a web based service for GPS/GNSS reference network coordinate calculation, integrity monitoring and deformation monitoring.

	Monitoring Service The Monitoring Service provides detection and warning of antenna movements in near real time for networks of GNSS reference stations or monitoring receivers. Site coordinates are calculated at a user defined interval. The solution is tailored to the needs of the customers network/project, including the processing interval, processing strategy, coordinate datum, limit checks and content of the secure online web service. An email messaging service is offered to provide warning when a significant movement occurs. The Monitoring Service consists of a one-time setup fee and then a quarterly subscription comprised of a base fee and a per site fee.
5002094	**CrossCheck Monitoring Setup Fee** For the initial configuration of the service. Once only.
5302771	**CrossCheck Quarterly Subscription Base Fee** For access to the web service for a period of three months (90 days). One article is required for each web service.
5302772	**CrossCheck Quarterly Subscription Per Site** For access to the web service for a period of three months (90 days). One article is required for each monitoring receiver.
	Billing • The initial setup fee will be invoiced after sending the entitlement number. • The Single Computation Service will be invoiced once the service has been completed. • The Monitoring Service will be invoiced quarterly at the end of the period, if not cancelled.
	Service Change Requests The amount of Quarterly Subscription Per Site of the Leica CrossCheck Monitoring Service can be changed at a month's notice for the next billing period. An administration fee (5002120) is incurred each time the number of points is increased or decreased.
	Cancellation • The Leica CrossCheck Monitoring Service can be cancelled with a month's notice for the next quarter. • The cancellation notice must be given in written form.

Sensors

7 Geodetic Sensors

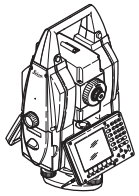
7.1 TM50/TS50/MS50



805 082	**TM50**	0.5" (0.15mgon), Total Station delivered with one full VGA colour touch screen, 1 GB internal flash memory, standard applications, Quick Guide, Documentation USB Card and upright container GVP648.
805 084	**TM50**	1" (0.3mgon), Total Station delivered with one full VGA colour touch screen, 1 GB internal flash memory, standard applications, Quick Guide, Documentation USB Card and upright container GVP648.
805 085	**TM50 I**	0.5" (0.15mgon), Total Station delivered with one full VGA colour touch screen, 5 Megapixel imaging, 1 GB internal flash memory, standard applications, Quick Guide, Documentation USB Card and upright container GVP648.
805 086	**TM50 I**	1" (0.3mgon), Total Station delivered with one full VGA colour touch screen, 5 Megapixel imaging, 1 GB internal flash memory, standard applications, Quick Guide, Documentation USB Card and upright container GVP648.
805 087	**TS50 I**	0.5" (0.15mgon), Total Station delivered with two full VGA colour touch screens, 5 Megapixel imaging, 1 GB internal flash memory, standard applications, Quick Guide, Documentation USB Card and upright container GVP648.
805 088	**MS50**	1" (0.3mgon), MultiStation delivered with two full VGA colour touch screens, 5 Megapixel imaging, 1 GB internal flash memory, standard applications, Quick Guide, Documentation USB Card and upright container GVP648.

7.2 TM30/TS30

☞ Only automated TPS can be used with GeoMoS. Instruments with ATR are recommended.

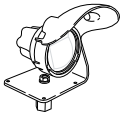


757 129	**TM30**	0.5" (0.15mgon), Total Station with reflectorless EDM (R1000), automatic target recognition, communication sidecover, internal memory, laser plummet, 1 keyboard, standard applications, user manuals, and upright container.
764 824	**TM30**	1" (0.3mgon), Total Station with reflectorless EDM (R1000), automatic target recognition, communication sidecover, internal memory, laser plummet, 1 keyboard, standard applications, user manuals, and upright container.
757 130	**TS30**	0.5" (0.15mgon), Total Station with reflectorless EDM (R1000), automatic target recognition, Power Search, communication sidecover, internal memory, laser plummet, 2 keyboards, electronic guide light EGL, standard applications, user manuals, and upright container.

7.3 Standard Reflectors

641 617	**GPR121**	Circular prism, with metal holder and target plate.

7.4 Monitoring Reflectors



726 295	**GPR112**	Monitoring-Mining Prism, with M8 internal thread in the back for direct mounting and 5/8" adapter.
726 296	**GHT112**	Mounting set for GPR112 with M8 and 5/8" internal thread adapters, suitable for direct fixing systems on nearly every surface, prism is adjustable and fixable in two axes.
727 406	**GDZ112**	Rain shelter for Monitoring Mining Prism GPR112. Full availability of the prism even in rainy conditions. The rain shelter protects the prism front against rain drops and dust.

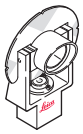
7.5 360° Reflectors

639 985	**GRZ4**	360° reflector.
754 384	**GRZ122**	360° reflector with 5/8" thread adapter for mounting of GPS antenna.

7.6 Precision Reflectors

555 631	**GPH1P**	Single-prism precision reflector.

7.7 Mini Reflectors

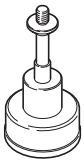


641 662	**GMP101**	Mini prism, incl. bubble, target plate and spike, in bag, also suitable for GLS11 and GRT44 (same height as GPH1, additive constant +17.5mm).
641 762	**GMP104**	Mini prism, with L-bar, for fixed installations.

7.8 Tribrachs

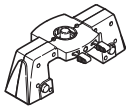
667 304	**GDF121**	Tribrach for TPS1200 Series, TM30/TS30, TM50/TS50/MS50, without optical plummet, pale green.

7.9 Carriers



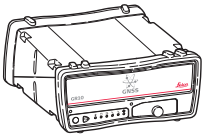
Carriers with 5/8" screw		
667 216	**GRT146**	Carrier with 5/8 inch screw, GNSS antenna screws on directly.
Carriers with stub		
667 313	**GRT144**	Carrier with stub, pale green.
667 217	**GAD31**	Screw-to-stub adapter for fitting GPS antenna on carriers with stub and poles with stub.

7.10 Handles



767 802	**GAD110**	SmartStation Adapter. Required to attach GAD112 to TS11/TS15/TS30/TM30/TS50/TM50/MS50 Total Station for GRZ122 360° reflector setup.
779 082		Adapter for GAD110 to setup GRZ122.

7.11 GNSS Sensors



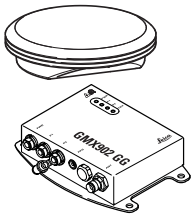
796 574	**GM10 Basic**	GM10 Basic, Single Frequency Monitoring Receiver, 120 channels with GPS L1. Multiple 1Hz raw data logging, data streaming and Ethernet.
796 575	**GM10 Performance**	GM10 Performance, GNSS Monitoring Receiver, 120 channels with GPS/GLONASS L1+L2, Multiple 20Hz raw data logging, data streaming and Ethernet.
796 576	**GM10 Professional**	GM10 Professional, High Frequency Monitoring Receiver, 120 channels with GPS/GLONASS L1+L2, Multiple 20 Hz raw data logging, data streaming and Ethernet, RINEX onboard and FTP push

	GM10 Basic	GM10 Performance	GM10 Professional
Supported GNSS Systems			
GPS L1	●	○	○
GPS L1 & L2 (including L2C)	○	●	●
GLONASS L1 & L2	○	●	●
Galileo E1/E5a/E5b/AltBoC	○	○	○
Position update & data recording			
1Hz logging and streaming	●	●	●
2-20Hz logging and streaming	○	●	●
50Hz logging and streaming	○	○	○
RINEX logging	○	○	●
Additional features			
FTP Push	○	○	●

● Standard, ○ Optional

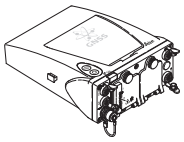
Purchasable Options for GM10

782 366	**GRL119**	Dual Frequency option for the GM receiver.
774 422	**GRL101**	GLONASS_L1+L2 option for GM GNSS receiver.
774 424	**GRL103**	Galileo_L1_E5ab_AltBOC option for GM GNSS receiver.
774 428	**GRL107**	RINEX option for GM GNSS receiver.
774 432	**GRL111**	FTP Push option for GM GNSS receiver.
774 430	**GRL109**	2-20Hz logging and streaming option for GM GNSS receiver.
774 431	**GRL110**	50Hz logging and streaming option for GM GNSS receiver. Requires GRL109.
774 429	**GRL108**	Extended Formats option for GR GNSS Receiver. Includes BINEX / CMR / CMR+.
774 411	**GRL100**	GPS_L5 option



Monitoring Receiver

755 231	**GMX901**	GPS Single Frequency smart antenna for Monitoring Applications.
758 600	**GMX902 GG**	GNSS Dual Frequency receiver for Monitoring Applications.
773 974	**GMX902 GNSS**	GPS/GLONASS/Galileo Triple Frequency receiver for Monitoring Applications.

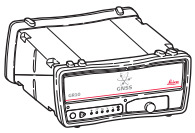


GNSS Sensors for Direct Connection to GeoMoS (RTK)

771 510	**GS10**	Leica GS10 Performance receiver.
771 511	**GS10**	Leica GS10 Professional receiver.

GNSS Sensors for Connection via GNSS Spider

766 730	**GRX1200+**	Triple Frequency GPS Reference Station Receiver, Professional, with Event Input, PPS Output, External Oscillator Input and Ethernet connectivity. Includes L2C.
766 733	**GRX1200+ GNSS**	GPS/GLONASS/Galileo Triple Frequency Reference Station Receiver, Professional, with Event Input, PPS Output, External Oscillator Input and Ethernet connectivity. Includes L2C. Requires separate software options for full time GPS L5/GLONASS and Galileo.

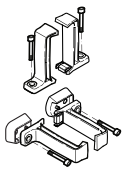


774 409	**GR10 Basic**	L1/L2 GPS reference receiver, 1Hz logging and streaming, 120 channels, external oscillator input and ethernet connectivity. Includes L2C/L2P tracking in parallel.
777 848	**GR10 Performance**	L1/L2 GPS reference receiver, 1Hz logging and streaming, 120 channels, external oscillator input and ethernet connectivity. Includes L2C/L2P tracking in parallel. Includes as standard the RINEX, FTP Push and Multi-Client options.
778 849	**GR10 Professional**	L1/L2/L5 GPS/GLONASS/Galileo reference receiver, 1Hz logging and streaming, 120 channels, external oscillator input and ethernet connectivity. Includes L2C/L2P tracking in parallel. Includes as standard the RINEX, FTP Push, Multi-Client, GPS L5, GLONASS and Galileo options.

For detailed description and article numbers see Equipment lists for Leica Viva GNSS and Equipment list for GNSS Networks and Reference Stations.

The particular of model of that GNSS that is recommended depends on how the sensor connection is made to GeoMoS. If the GNSS is to be directly connected to GeoMoS (computation done on the sensor), RTK rover GNSS must be used. If the position computation is to be done by Leica GNSS Spider (recommended) then reference station GNSS or monitoring receivers should be used.

7.12 Holder and Mounting Kits for GR10/GM10



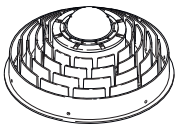
Mounting kits for GR10/GM10 receiver

774 439	**GEV249**	Rack Mount Kit for GR10/GM10 receiver. For fitting the receiver to standard IT rack (requires 2 U in the rack).
774 440	**GEV250**	Wall Mount Kit for GR10/GM10 receiver. For attaching the receiver to a wall bench, table or cabinet.

Adjustable Tilt Monument Mount

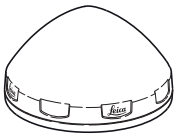
2072-33	**SECO 2072-33**	**Adjustable Tilt Monument Mount.** Stainless steel adapter with brass 5/8 x 11 adapted. Can be levelled by three adjusting screws with a tilt range of +/- 7 degrees. Adjustable in azimuth to permit orientation of the antenna to north. This is a third party product of SECO Manufacturing Company Incorporated.

7.13 Choke Ring Geodetic Reference Station Antenna



765 733	**AR25**	GNSS choke ring antenna for GPS/GLONASS/Galileo/Compass receivers. Includes Galileo E6 and L-Band signals. Dorne-Margolin antenna element.
765 734	**GVP653**	Weather-protection radome for AR25 GNSS choke ring antenna.

7.14 Non-choke Ring Geodetic Reference Station Antennas



773 758	**AR10**	GNSS reference station antenna for GPS/GLONASS/Galileo/Compass receivers. Includes Galileo E6 and L-Band signals. Built-in ground plane.

7.15 Compact Geodetic Antennas

770 701	**AS10**	GPS/GLONASS/Gallileo triple frequency antenna.

7.16 Memory Devices

SD Cards

767 856	**MSD1000**	SD memory card 1GB for GR10/GM10 receiver.
789 139	**MSD08**	SD memory card 8GB for GR10/GM10 receiver.

CF Cards

733 257	**MCF256**	CompactFlash card 256MB for GRX1200+ receiver.
745 995	**MCF1000**	CompactFlash card 1GB for GRX1200+ receiver.
772 567	**MCF8000**	CompactFlash card 8GB for GRX1200+ receiver.

7.17 Supported Sensors

723 289	**DNA03**	0.3mm, precision digital level, magnetically-damped compensator, with user manual and container.
726 540	**DNA10**	0.9mm, digital level, magnetically-damped compensator, with user manual and container.
762 630	**SPRINTER 150M**	Electronic level with internal memory, standard deviation 1.5 mm, includes container, strap, adjustment tools, user manual, 4 AA batteries, USB cable, CD.
762 631	**SPRINTER 250M**	Electronic level with internal memory, standard deviation 1.0 mm, includes container, strap, adjustment tools, user manual, 4 AA batteries, USB cable, CD.

7.18 Staffs

DNA Staffs

560 271	**GPCL3**	Invar bar code levelling staff, 3m, with circular level.
560 274	**GPCL3L+T**	Invar bar code levelling staff, 3m, with circular level, with expansion coefficient certificate and length calibration certificate.
563 659	**GPCL2**	Invar bar code levelling staff, 2m, with circular level.
632 313	**GWCL92**	Industrial bar code levelling staff, 92 cm, invar staff with circular bubble and 2 interchangeable bases.
563 733	**GWCL60**	Invar bar code scale, 60 cm.
522 793	**GKNL4F**	Dual face levelling staff, 13.3ft, 3 sections, code/ft graduation, with handles and circular bubble, in transport bag.
667 113	**GTL4C**	Telescopic levelling staff, 4m, aluminium, bar code/mm-graduation, with bull'seye bubble, in transport bag

Sprinter Staffs

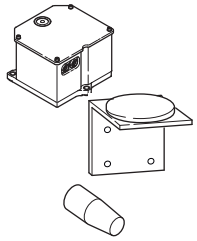
741 882	**GSS111**	Dual face telescopic levelling staff, 5m, 4 sections, SPRINTER barcode / E-Scale cm-graduation, with circular bubble, in transport bag (Standard version).
741 883	**GSS111-1**	Dual face telescopic levelling staff, 5m (16.4ft), 4 sections, SPRINTER barcode / ft-graduation, with circular bubble, in transport bag, (Imperial version).
741 884	**GSS112-3**	Dual face telescopic levelling staff, 4m, 4 sections, SPRINTER barcode / E-Scale cm-graduation, with circular bubble, in transport bag (UK version).

741 885	**GSS111-2**	Dual face telescopic levelling staff, 5m, 4 sections, SPRINTER barcode / 5mm graduation, with circular bubble, in transport bag (Japan version).
741 886	**GSS112-5**	Dual face telescopic levelling staff, 4m, 4 sections, SPRINTER barcode / 2mm graduation, with circular bubble, in transport bag (Spain version).
746 613	**GSS112**	Dual face telescopic levelling staff, 4m, 4 sections, SPRINTER barcode / E-Scale cm-graduation, with circular bubble, in transport bag (Standard version).
746 614	**GSS122-3**	Dual face telescopic (Fibreglass) levelling staff, 4m, 4 sections, SPRINTER barcode / E-Scale cm-graduation, with circular bubble, in carry case (UK version).
764 452	**GSS113**	Fibreglass dual face staff, 3 m, 1 section, Sprinter barcode/E-scale cm-graduation, with circular bubble, transport bag.

8 Geotechnical Sensors

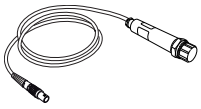
8.1 Inclination Sensors

The Nivel20 and Nivel200 are a series of highly precise inclination sensors from Leica Geosystems.



Nivel Sensors		
576 198	**NIVEL210**	Inclination sensor with RS232 interface.
576 199	**NIVEL220**	Inclination sensor with RS485 interface.
Accessories		
749 031	**GHT59**	Wall Mounting Kit for NIVEL200.
575 869		Terminator for RS485. One terminator must be ordered and installed for each installation with Nivel220 sensors.

8.2 Meteo Sensors



667 726	**DTM**	STS meteo sensor, combined pressure and temperature sensor, 2.0m cable with Lemo 1.

For more third party geotechnical sensors see chapter "13 Third Party".

Communication

9 Leica M-Com

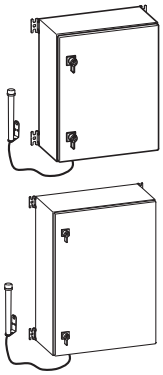
The Leica M-Com series are the first compact plug & play solutions for monitoring communication.

- The Leica ComBox provides the communication from the sensors in the field to the Internet via a mobile communication provider (GSM/UMTS/HSDPA/HSUPA).
- The Leica MonBox30, as an optional accessory in the ComBox, allows running the Leica GeoMoS Software on an embedded computer in the field. This ensures that the monitoring system runs continuously during possible communication breakdowns.
- Full monitoring functionality installed in one Leica ComBox creates a simply mobile monitoring solution.
- The results and information produced by such a system are visualized over Leica **GeoMoS Web** service.

The Leica M-Com series offers easy installation, reliable communication, connection of multiple sensors and external devices. This increases the mobility for periodic or short term monitoring systems.

9.1 Leica ComBox

Please contact the Heerbrugg product management before ordering the Leica ComBox devices outside of the European Economic Area (EEA).



772 180	**ComBox10**	Communication box, providing the connection of up to 2 sensors to the mobile Internet. User Manual and configuration software CD-ROM included. ComBoxes will be delivered pre-configured. The customer has to finish the configuration with his local settings, the configuration software CD-ROM is to be used.
772 181	**ComBox20**	Communication box, providing the connection of up to 4 sensors to the mobile Internet, including two access points for warning devices, three Power over Ethernet (PoE) access points and a meteo sensor. User Manual and configuration software CD-ROM included. ComBoxes will be delivered pre-configured. The customer has to finish the configuration with his local settings, the configuration software CD-ROM is to be used.

Condition

To use a ComBox the following items are essential and must be organised locally prior to installation:

From a Mobile Provider:

- a SIM card for the wireless router, that supports the connection from the Internet to the wireless router via a public IP address. The SIM card with the correct data contract for accessing mobile Internet must be organized from the customer. The mobile provider needs to support public dynamic IP addresses.
- a GPRS/UMTS breakout number or a standard telephone number
- if essential, the knowledge about an user name and a password
- the knowledge about the Access Point Name
- the knowledge about the authentication method: Challenge Handshake Authentication Protocol (CHAP) or Password Authentication Protocol (PAP)
- the knowledge about PPP (Point-to-Point Protocol) DNS query: Specification whether a DNS request to the provider is made or not.

From Dynamic Network Services Inc. (www.dyndns.com):

- a DynDNS Account with following details: an user name, a password, a host name (e.g. "myComBox.dyndns.org"), a server address (normally "members.dyndns.org" is used) and a server port (normally 80 or 8245). This DynDNS Account is required to convert dynamic IP addresses to a static DynDNS name.

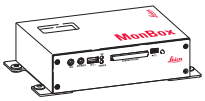
Additional hardware:

- a personal computer with a monitor, a keyboard, a PC mouse and an Ethernet cable in order to configure the ComBox.
- an isolated screwdriver size 0 in order to connect the sensor cables with the ComBox tools in order to mount the ComBox.

The appropriate **Cables** to connect the **Sensors** must be separately ordered.

9.2 Leica MonBox

The Leica MonBox30 is an energy-efficient Intel® based mini-industrial computer where Leica Geosystems monitoring software is running.



772 182	**MonBox30**	An energy-efficient Intel® based mini-industrial computer with a robust housing. User Manual, USB memory stick with the images of the operating system and monitoring software, CompactFlash (CF) card and power supply unit included. MonBoxes will be delivered pre-configured. The customer has to finish the configuration with his local settings, the User Manual is to be used. GeoMoS Software must be separately purchased and can be only activated with a valid Entitlement ID.
		Running software Following software programs run on the MonBox30 respectively CF-card: • Leica GeoMoS Monitor • Leica GeoMoS Analyzer • Leica GeoMoS Adjustment • Leica Configuration Tools (NIVEL Tool, GMX902 Config Tool, etc.) • Leica License Management System (Client License Manager) • Microsoft® SQL Server® Express • Microsoft® SQL Server® Management Studio • Windows® Internet Explorer® • RealVNC Free Edition GeoMoS Software must be separately purchased and can be only activated with a valid Entitlement ID.
		Note • The MonBox30 can be used as an optional accessory in the ComBox or as a stand-alone monitoring solution in the field or in the office. • An integrated MonBox30 in a ComBox is accessible over the mobile Internet. The remote access from office to field is realized with a VNC application. • The operation system and all monitoring software is delivered on a Leica memory stick. Before the MonBox30 can be used the operating system and the appropriate software has to be installed from the supplied memory stick on the CF-card once. The memory stick can be used to recover the CF-card. • GeoMoS Software must be separately purchased and can be only activated with a valid Entitlement ID. Please refer to the chapter **Sensor License**. • In order to activate the GeoMoS Software an Internet connection to the MonBox is required.
		Trademarks • Intel is a registered trademark of Intel Corporation. • CompactFlash and CF are registered trademarks of SanDisk Corporation. • Windows is a registered trademark of Microsoft Corporation. • SQL Server is a registered trademark of Microsoft Corporation. • Internet Explorer is a registered trademark of Microsoft Corporation. • RealVNC Free Edition is a registered trademark of RealVNC Limited.

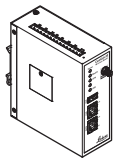
Accessories

779 496	**MCF16GBF**	CompactFlash card 16 GB for the MonBox30, industrial grade, fixed disk.
779 498	**GEV248**	Power supply unit for MonBox30, for indoor use only, input 100-240 VAC 50-60 Hz, output 19 VDC.

779 497	**MS16MON**	USB memory stick, contains the images with the operating system and monitoring software, 16 GB.

9.3 Leica ComGate

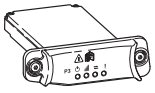
The Leica ComGate is a wireless router to connect TM50/TS50/MS50 over USB or any serial sensor (e.g. Total Station, GNSS Sensor) to mobile internet or any LAN infrastructure.



808 325	**COMGT10 UMTS**	Leica ComGate10, wireless router to connect Leica TPS over USB port or serial port to Ethernet, incl. DSL and GSM/UMTS connection.
808 326	**COMGT10 L13**	Leica ComGate10, wireless router to connect Leica TPS over USB port or serial port to Ethernet, incl. DSL and LTE Verizon connection.
Accessories		
808 327	**CT-AT466 SMA**	External wall mounting antenna (GSM/UMTS) for Leica ComGate10, incl. 5m cable.
808 333	**GEV271**	Y-cable for Leica ComGate10, 4m, connects Leica MS50/TS50/TM50 to USB port on ComGate10 with open ended wires for power supply and RS232.
722 411		Power cable with protection fuse, connects ComGate10 to GEV270. Can also be used to connect GPS receivers to 12V power supplies.

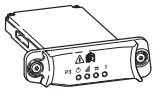
10 Slot-in Devices for GR10/GM10

For use with GR10/GM10 for transmitting RTK or DGPS corrections.



Satelline radio modules		
776 233	**SLR1-2**	Satelline TA11 403-470 MHz TXO radio. RTK transmitting only UHF radio module to be easily plugged into the GR/GM receiver.
788 725	**SLR5-1**	Satelline M3-TR1 403-470 MHz transmit/receive UHF radio module to be easily plugged into the GR/GM receiver.
6002544		Configuration tool kit for programming Satelline SLR RTK radio modules; includes programming cable GEV231 and configuration software CD ROM.

SLR radios will be delivered pre-configured according to country-specific radio regulations. In countries where radios need to be configured locally, the configuration tool kit is to be used.

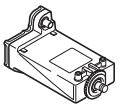


Mobile phone modules		
776 236	**SLG1-2**	5-Band (850/900/1800/1900/2100 MHz) Telit 3G GSM/GPRS/UMTS module. Provides full flexibilty due to 5-band technology, supports all GSM, GPRS, EDGE and UMTS network providers. Can easily plugged into the GR/GM receiver.
776 237	**SLG2-2**	4-Band (850/900/1800/1900 MHz) MC75i GSM/GPRS/EDGE module. Universal 4-band technology, supports GSM, GPRS and EDGE network providers. Can easily plugged into the GR/GM receiver.

External high power radios such as Satelline Epic Pro (10, 35W), Pacific Crest (2, 35W) or GFU radios can be used for RTK communication instead of the slot-in RTK modems.

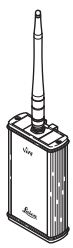
11 External Serial Devices

11.1 Satelline Radio Modems



Satelline modems		
767 859	**GFU27**	Satelline M3-TR1 403-470 Mhz RX/TX radio in GFU housing. Transceiver UHF radio module, for GS09/GS10 receiver. (User manual and CE-Declaration of Conformity included.)

11.2 TCPS29 Modems



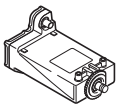
788 854	**TCPS29**	TCPS29, Long range bluetooth radio modem with antenna and user manual. Used as external radio modem for TS total stations or PC. (frequency range 2402 - 2480MHz).

11.3 Antennas for Radio Modems

639 964	**GAT1**	Gainflex radio antenna (frequence range 400-435MHz).
667 243	**GAT2**	Gainflex radio antenna (frequence range 435-470MHz).

12 Mobile Phone

12.1 Mobile Phones



767 860	**GFU28**	5-Band (850/900/1800/1900/2100 MHz) Telit 3.5G GSM/GPRS/UMTS module. Provides full flexibility due to 5-band technology and is global compatible to all GSM, GPRS, EDGE and UMTS network providers.

12.2 Antennas for Mobile Phones

782 500	**GAT18**	Multiband GSM/UMTS Antenna for 850/1900MHz, for 900/1800MHz and for 2100MHz mobile networks.

13 Third Party

13.1 Converter

RS232/RS485 Converter

I-7520	RS232 to RS485 converter for Nivel220 sensors. ☞ This is a product of ICP DAS Co.

RS232/Ethernet Converter

1 serial port, 3 serial ports	RS232 to Ethernet converter for total stations and Nivel210 sensors. ☞ This is a product of Wiesemann & Theis GmbH.
MOXA 5110	RS232 to Ethernet converter for total stations and Nivel210 sensors. ☞ This is a product of Moxa Inc.

13.2 Digital IO card

Web IO	The Web IO (2x Digital Input, 2x Digital Output) connects digital input and output ports of industrial 24V technology to the network. ☞ This is a product of Wiesemann & Theis GmbH.
ICP DAS I/O Card	The PCI-P16R16 provides 16 optically isolated inputs and 16 Relay outputs. The PCI-P16R16 has those two 37-pin D-Sub connector. It can be installed in a 5 V PCI slot. ☞ This is a product of ICP DAS Co.

13.3 Datalogger

CR1000, Multiplexer	CR1000 Measurement and control module C/W CR1000WP AM16/32A 16/32 channel relay Multiplexer C/W SPARK GAPS. ☞ This is a product of Campbell Scientific Ltd.

13.4 Wireless Ethernet Radio

ELPRO 805U-E	The ELPRO 805U connects serial or Ethernet devices by industrial wireless radio modems. ☞ This is a product of ELPRO Technologies.

13.5 Mini Adapter

	Null modem or RS232 reverser	A null modem (or RS232 reverser) reroutes wiring. **Specification** A null modem crosses pins 2 and 3, so that pin 2 on one side is connected to pin 3 on the other.
	Gender changer	A gender changer is a small hardware device or adapter that is used to correct the connector mismatches of cables. **Specification** Pins connected 1:1

13.6 Meteo Sensors

	W&T Web-Thermo-Hygrobaro-graph	**W&T Web-Thermo-Hygrobarograph** The sensor measures air temperature, relative humidity and air pressure. ☞ This is a product of Wieseman & Theis GmbH.
	Vaisala WXT520 sensor	The sensor measures air temperature, relative humidity, barometric air pressure, wind speed, wind direction, rain and hail. The Vaisala sensor comes along with accessories (cables, mounting, etc.). Please check the Vaisala order form. ☞ This is a product of Vaisala.

13.7 USB-to-Serial Converter

	ATEN UC-232A	This converter connects a RS232 device to the USB port of any ComGate10.

Power

14 Power Supply

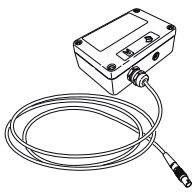
14.1 Mains Power Supply for GPS1200 and NIVEL sensors

Power supply for GR10/GM10, GRX1200+, Nivel210, Nivel220		
807 696	**GEV270**	Power supply unit for TPS/Nivel2x0, for indoor use only, input 100V-240VAC 50-60HZ, output 13.2VDC, cable with 5-pin Lemo to connect power cables. Standard mains/line cable select from following list.
560 130	**GEV97**	1.8m power cable to connect Nivel2x0 with GEV270.
774 437	**GEV242**	Power supply for GR10/GM10 and GMX902 receiver, for indoor use only, input 100V-240VAC 50-60HZ, output 24VDC, cable with 5-pin Lemo to connect to receiver. ☞ Do not use this 24VDC for any NIVEL sensor connection. Standard mains/line cable select from following list.
Power cords		
731 772		1.5m power cable. Allows receiver to be externally powered via the power jack. **Usable in the US.**
731 773		1.5m power cable. Allows receiver to be externally powered via the power jack. **Usable in the EU.**
734 232		1.5m power cable. Allows receiver to be externally powered via the power jack. **Usable in the UK.**
734 233		1.5m power cable. Allows receiver to be externally powered via the power jack. **Usable in Australia.**
738 586		1.5m power cable. Allows receiver to be externally powered via the power jack. **Usable in Switzerland.**

14.2 Mains Power Supply for TPS sensors

Power supply for TPS		
807 696	**GEV270**	Power supply unit for TPS/Nivel2x0, for indoor use only, input 100V-240VAC 50-60HZ, output 13.2VDC, cable with 5-pin Lemo to connect power cables. Standard mains/line cable select from following list.
Power cords		
731 772		1.5m power cable. Allows receiver to be externally powered via the power jack. **Usable in the US.**
731 773		1.5m power cable. Allows receiver to be externally powered via the power jack. **Usable in the EU.**
734 232		1.5m power cable. Allows receiver to be externally powered via the power jack. **Usable in the UK.**
734 233		1.5m power cable. Allows receiver to be externally powered via the power jack. **Usable in Australia.**
738 586		1.5m power cable. Allows receiver to be externally powered via the power jack. **Usable in Switzerland.**

15 Switchbox



744 793	**GDZ67**	Switchbox with a 2.0m cable for TPS1000/TPS1100/TPS1200/TS15 (Lemo 0) and GeoMoS.
772 630	**GEV239**	Switchbox with a 2.0m cable for TM30/TS30/TM50/TS50/MS50 (Lemo 1) and GeoMoS.

Cables

16 Power and Data Transfer Cables

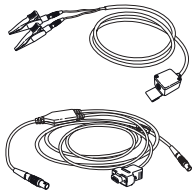
16.1 ComGate Cables

808 333	**GEV271**	Y-cable for Leica ComGate10, 4m, connects Leica MS50/TS50/TM50 to USB port on ComGate10 with open ended wires for power supply and RS232.
722 411		Power cable with protection fuse, connects ComGate10 to GEV270. Can also be used to connect GPS receivers to 12V power supplies.

16.2 ComBox Cables

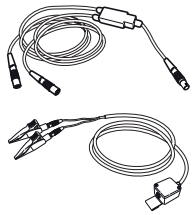
772 184	**GEV241**	Interface Cable, 3 m, connects TPS (1000/1100/1200/TS15 and Meteo Sensor) to ComBox. (Lemo to unterminated)
772 183	**GEV240**	Interface Cable, 3 m, connects TS30/TM30/TM50/TS50/MS50 to ComBox. (Lemo to unterminated)
779 138	**GEV247**	Power cable, 2 m, connects GMX902 to ComBox. (Lemo to unterminated)
750 073	**GEV212**	Interface Cable, 5m, connects GMX901 to ComBox or custom installation. (Lemo to unterminated).
748 489	**GEV207**	1.8m communication cable, connects Nivel220 to ComBox, terminal strip or RS232/RS485 converter. (Lemo to unterminated).

16.3 Total Station Cables



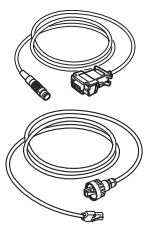
439 038	**GEV71**	4m car battery cable, connects TPS, GPS receiver or DNA (Lemo-1, 5 pin, female) to 12V car battery. ☞ For TPS e.g. the additional cable 734 698 or 759 257 is required.
734 698	**GEV187**	Y-cable, connects TPS1000/TPS1100/TPS1200 to PC (9-pin RS232 serial) and external battery, 2.0m.
759 257	**GEV220**	Y-cable, connects TM30/TS30/TM50/TS50/MS50 to PC (9-pin RS232 serial) and external battery, 2.0m.
793 364	**GEV261**	X-cable, connects TM50/TS50/MS50 to PC with USB and RS232 (9-pin) and external battery, 1.8m.

16.4 GNSS / GMX902 / GM10 Cables



To connect two independent power supplies

733 298	**GEV172**	2.8m Y-cable, connects GPS Receiver with two external power supplies. ☞ For GR10/GM10 this cable should only be used to connect any combination of 807 696 power supply and cable 560 130 or external batteries. To connect one 774 437 power supply, use the 774 438 Y cable.
774 438	**GEV243**	Y Cable, 2.8m, connects GR10/GM10 to 774 437 GR10/GM10 power supply and external battery. One Lemo-1, 5 pin male connector, two Lemo-1,5 pin female connectors or 807 696 power supply and cable 560 130 or external batteries.
807 696	**GEV270**	Power supply unit for TPS/Nivel2x0, for indoor use only, input 100V-240VAC 50-60HZ, output 13.2VDC, cable with 5-pin Lemo to connect power cables.
560 130	**GEV97**	1.8m power cable to connect Nivel2x0 with GEV270.

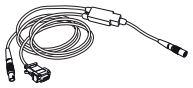


To connect battery, car battery or alternate power supply

807 696	**GEV270**	Power supply unit for TPS/Nivel2x0, for indoor use only, input 100V-240VAC 50-60HZ, output 13.2VDC, cable with 5-pin Lemo to connect power cables.
560 130	**GEV97**	1.8m power cable to connect Nivel2x0 with GEV270.
439 038	**GEV71**	4m car battery cable, connects TPS, GPS receiver or DNA (Lemo-1, 5 pin, female) to 12V car battery. ☞ For GPS e.g. the 560 130 is required.
560 130	**GEV97**	1.8m cable, connects GEB171 external battery to GPS1200 receiver. Lemo-1, 5 pin, male to Lemo-1, 5 pin, male.
722 411		Cable with protection fuse to connect 12V power supply to GPS receiver.

To transfer data between sensor and GNSS Spider		
733 280	**GEV160**	Serial data transfer cable, 2.8m, connects GRX1200+, GR10/GM10, GMX902 or CS09 to PC for data transfer, firmware upload etc. Lemo 8 to 9 pin RS232 serial connector.
563 809	**GEV113**	2.8m Modem cable. Connects GRX1200+ receiver Ports 1, 2 and 3, GR10/GM10 or GMX902 to modem (Lemo 8 pin to 9 pin RS232 male serial connector).
733 290	**GEV168**	5.0m network cable. Connects GRX1200+ or GR10/GM10 receiver with Ethernet LAN / RJ45 (ruggedised connector to GNSS receiver).

16.5 GMX901 Cables



750 073	**GEV212**	Interface Cable, 5m, connects GMX901 to ComBox or custom installation. (Lemo to unterminated).
743 389	**GEV197**	Y-cable, 2.8m, GMX901 to RS232 and external Leica power supply.

16.6 Antenna Cables

Short cables		
667 200	**GEV141**	1.2m antenna cable.
667 201	**GEV142**	1.6m extension for antenna cable.
724 969	**GEV194**	1.8m antenna cable.
788 145	**GEV253**	2m antenna cable (11mm).
Medium cables		
636 959	**GEV120**	2.8m antenna cable.
632 372	**GEV119**	10m antenna cable.
788 146	**GEV254**	10m antenna cable (11mm).
Extra Long cables		
632 390	**GEV108**	30m antenna cable.
664 813	**GEV134**	50m antenna cable.
713 483		70m antenna cable.
Longer antenna cables and signal amplifiers can be supplied on request.		

16.7 Level Cables

439 038	**GEV71**	4m car battery cable, connects TPS, GPS receiver or DNA (Lemo-1, 5 pin, female) to 12V car battery. ☞ For Levels e.g. the 734 698 is required.
734 698	**GEV187**	Y-cable, connects TPS to PC (9-pin RS232 serial) and external battery, 2.0m.

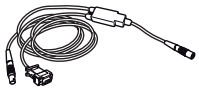
16.8 Nivel210 / Nivel220 Cables

To connect a Nivel210 directly to GPS1200		
749 916	**GEV209**	1.8m communication and connection cable, Nivel210 to GPS1200.
To connect a Nivel210 directly to PC		
802 902		1.0m connection cable, connects Nivel210 sensor ports 1 or 2 to PC for data communication etc., Lemo-0 to 9 pin RS232 serial connector.
748 335	**GEV204**	Power supply-cable for NIVEL210 and NIVEL230. (Lemo -Lemo), 1.8m.
To connect a Nivel220		
802 906		5.0m connection cable RS485. Connects two Nivel220 sensor ports 1 or 2, Lemo-0 to Lemo-0.
802 907		20.0m connection cable RS485. Connects two Nivel220 sensor ports 1 or 2, Lemo-0 to Lemo-0.
748 488	**GEV206**	0.8m power supply cable, connects power supply unit (807 609) and cable (560 130) to RS232/RS485 converter, Lemo-0 to 2 wires to terminal strip.
748 489	**GEV207**	1.8m communication cable, to ComBox, terminal strip or RS232/RS485 converter. (Lemo to unterminated).
807 696	**GEV270**	Power supply unit for TPS/Nivel2x0, for indoor use only, input 100V-240VAC 50-60HZ, output 13.2VDC, cable with 5-pin Lemo to connect power cables.
560 130	**GEV97**	1.8m power cable to connect Nivel2x0 with GEV270.

16.9 Meteo Sensor Cables

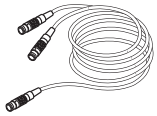
764 328	**GEV222**	Adapter cable DTM sensor, Lemo-1 (female) to Lemo-0 (female), 3.0m.
734 698	**GEV187**	Y-cable, connects TPS to PC (9-pin RS232 serial) and external battery, 2.0m.
439 038	**GEV71**	4m car battery cable, connects TPS or GPS receiver (Lemo-1, 5 pin, female) to 12V car battery. ☞ For DTM meteo sensor e.g. the additional cable 734 698.

16.10 Satelline Cables



733 297	**GEV171**	1.8m cable to program the Satelline 3AS radio modem inside the GFU27 housing.

16.11 TCPS29 Cables



734 697	**GEV186**	Y-cable, connects TCPS29 to TPS1000/1100/1200 and external battery, 1.8m.
771 057	**GEV236**	Y-cable, connects TCPS29 to TM30/TS30/TM50/TS50/MS50 and external battery, 1.8m.

16.12 Adapter

707 525	**GK1**	Lemo Canon converter 30°, for PC.

Support - Service

17 CCP - Software

A wide selection of comprehensive Customer Care Packages (CCPs) is available bundling Hardware Maintenance, Software Maintenance, Customer Support and Extended Warranty.
For more information about the CCP offering in your country please contact your local Leica Geosystems organization or distribution partner.

18 Extended warranty for GMX900 receivers

GMX902 GG and GMX902 GNSS	
89332	1 year extended warranty for GMX902 GG/GNSS.
5301720	2 year extended warranty for GMX902 GG/GNSS.
5301721	Additional 1 year GMX902 GG/GNSS Warranty Extension.
GMX901	
5301722	1 year extended warranty for GMX901.
5301723	2 year extended warranty for GMX901.
5301724	Additional 1 year GMX901 Warranty Extension.

19 Other Services

The following services are available on request at daily rates:

- Training at customer site
- Installation support
- Customizing

Information on article numbers are available on request.

Licenses Examples

20 Sensor Licenses - Examples

Example 1:
Your customer wants to use a total station and a temperature sensor for monitoring with GeoMoS.
How many Sensor Licenses must he order?

1x TPS Sensor	30
1x Temperature Sensor (DTM STS)	1
Sensor Licenses (774 134)	31

Example 2:
Your customer wants to use a Nivel220 bus system with five sensors for monitoring with GeoMoS.
How many Sensor Licenses must he order?

5x Nivel200 Sensor	5 x 3
Sensor Licenses (774 134)	15

Example 3:
Your customer wants to use a combined TPS/GNSS monitoring system with a total station and GNSS Spider RT positioning products for monitoring with GeoMoS. Therefore five GNSS sensors are connected as passive LB2 and two GNSS sensors as active data streams to GNSS Spider.
How many Sensor Licenses must he order?

1x TPS Sensor	30
1x Connection to a GNSS Spider Site Server with all Spider RT Positioning Products	10
Sensor Licenses (774 134)	40

The Spider RT Positioning Products computation requires additional Spider Positioning Site Licenses.

Example 4:
Your customer wants to use a combined TPS/GNSS monitoring system with a total station and GNSS Spider RT and PP positioning products for monitoring with GeoMoS. The customer has 12 GNSS sensors are connected to GNSS Spider.
How many Sensor Licenses must he order?

1x TPS Sensor	30
1x Connection to a GNSS Spider Site Server with all Spider RT Positioning Products	10
1x Connection to a GNSS Spider Site Server with all Spider PP Positioning Products	10
Sensor Licenses (774 134)	50

The Spider RT and PP Positioning Products computation requires additional Spider Positioning Site Licenses and Spider File Products Service (FPS) option.

Example 5:
Your customer wants to use a Campbell Scientific Datalogger with different geotechnical sensors for monitoring with GeoMoS.
How many Sensor Licenses must he order?

Setup A	1 sensor measuring one value type (e.g. wind speed)	01
Setup B	1 sensor measuring three value types (e.g. temperature, pressure and humidity)	03
Setup C	1 sensor measuring one value type (e.g. wind speed) and 1 sensor measuring one value type (e.g. rain fall)	02
Setup D	5 sensors measuring three value types (e.g. temperature, pressure and humidity)	15
	Sensor Licenses (774 134)	21

Trademarks & Technical Data

21 Trademarks

The *Bluetooth*® word mark and logos are owned by Bluetooth SIG, Inc. and any use of such marks by Leica Geosystems AG is under license.
SD is a trademark of the SD Card Association.
Microsoft is a registered trademark of Microsoft Corporation.
Other trademarks and trade names are those of their respective owners.

22 Technical Data

Laser plummet:
Laser class 2 in accordance with IEC 60825-1 resp. EN 60825-1

Guide light (EGL):
LED class 1 in accordance with IEC 60825-1 resp. EN 60825-1

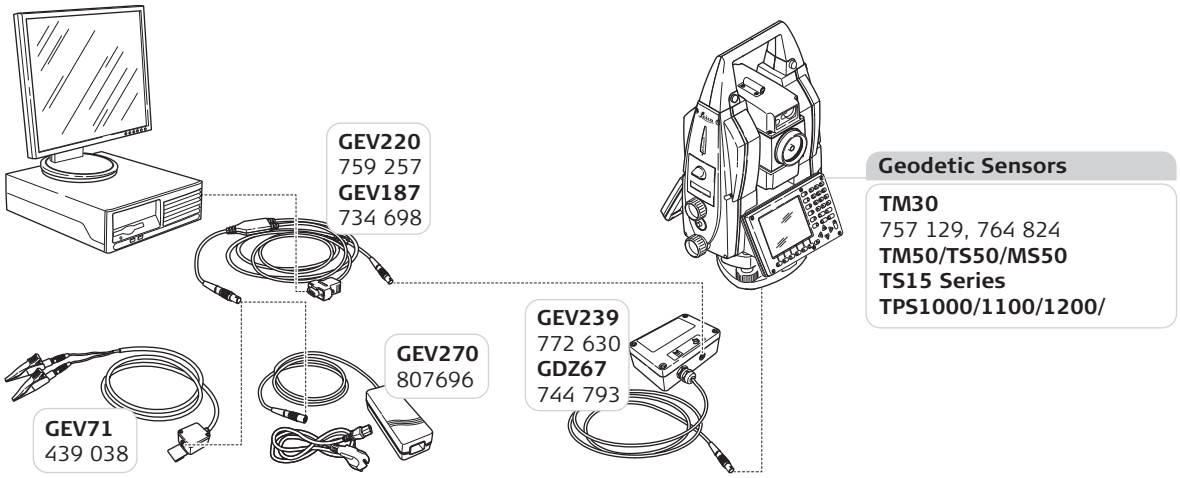
Distance meter (Prism):
Laser class 1 in accordance with IEC 60825-1 resp. EN 60825-1

Distance meter (Non-Prism):
Laser class 3R in accordance with IEC 60825-1 resp. EN 60825-1

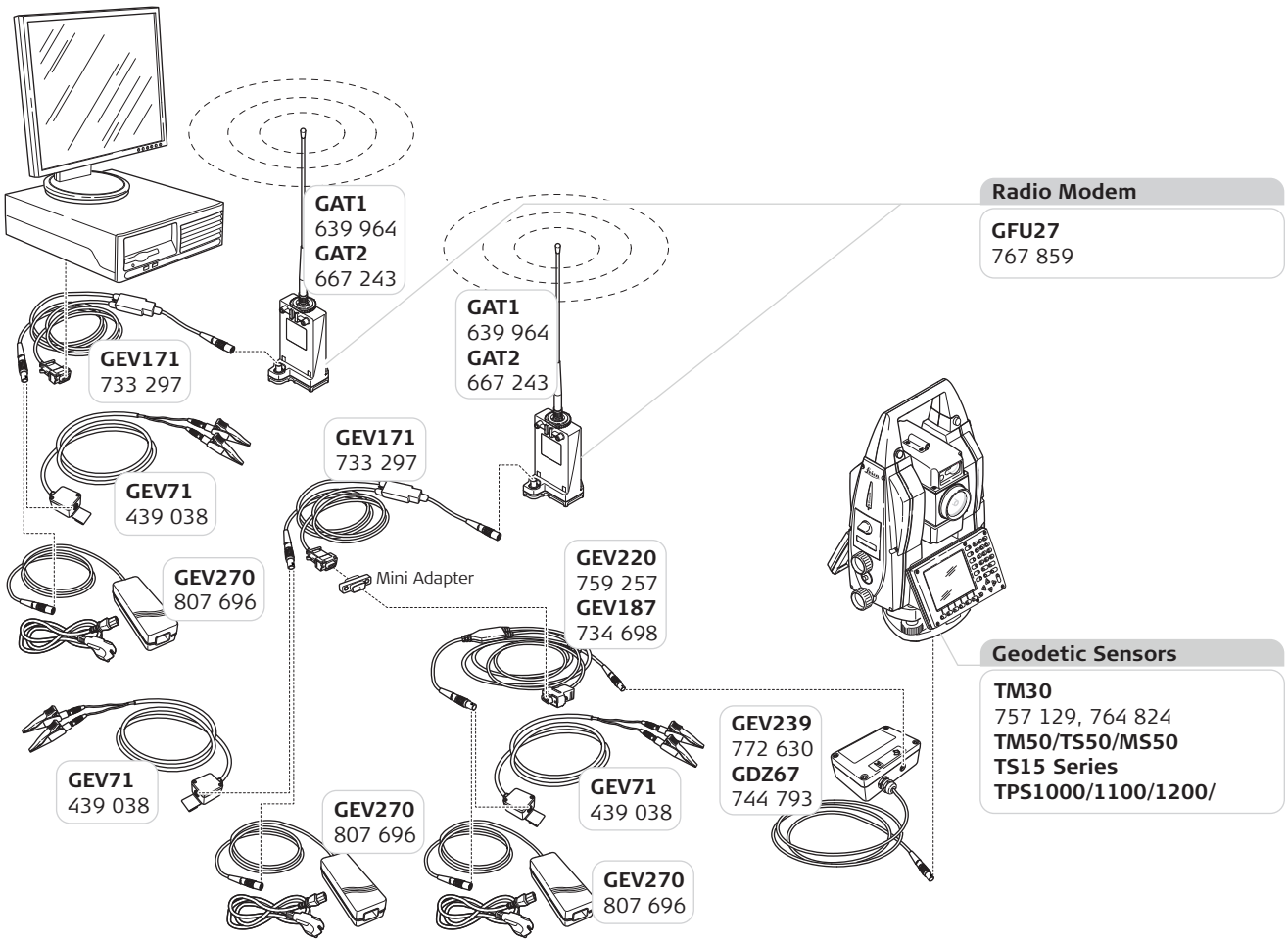
Setups

23 Setup of a Total Station

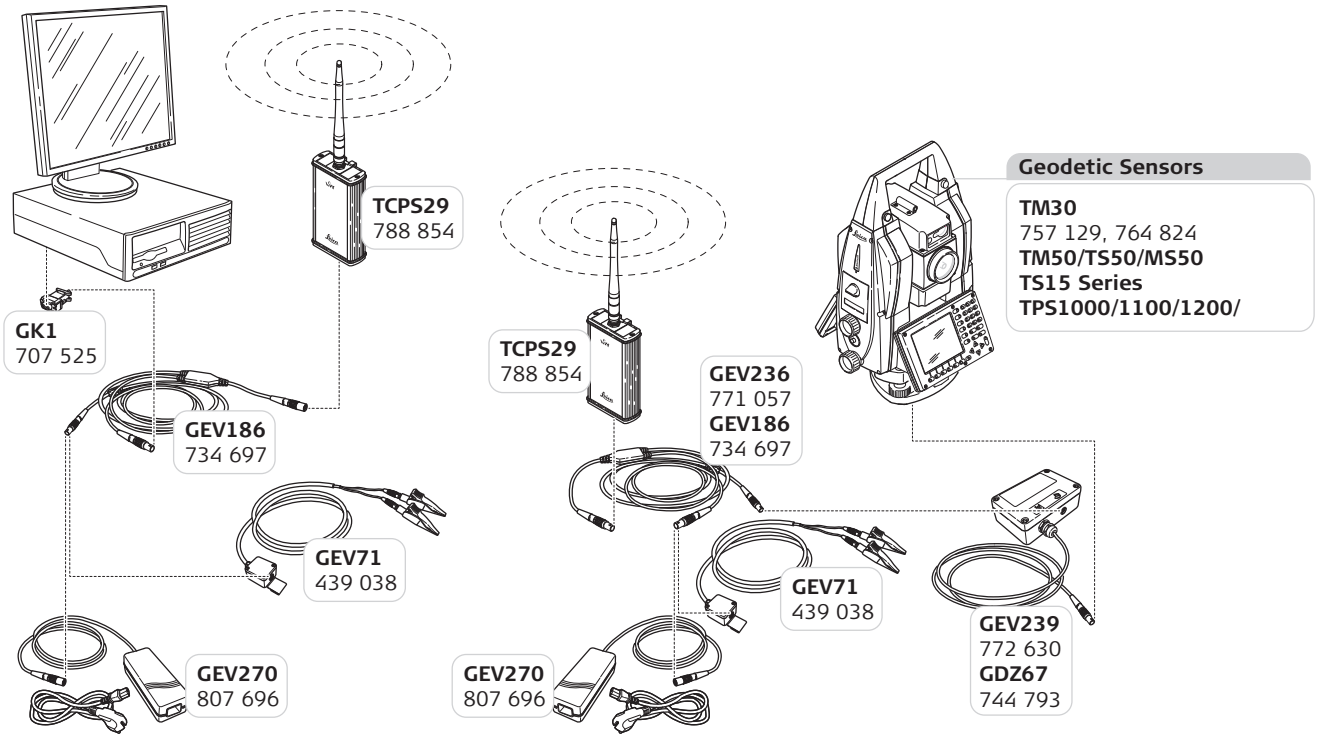
23.1 Total Station with Direct Serial



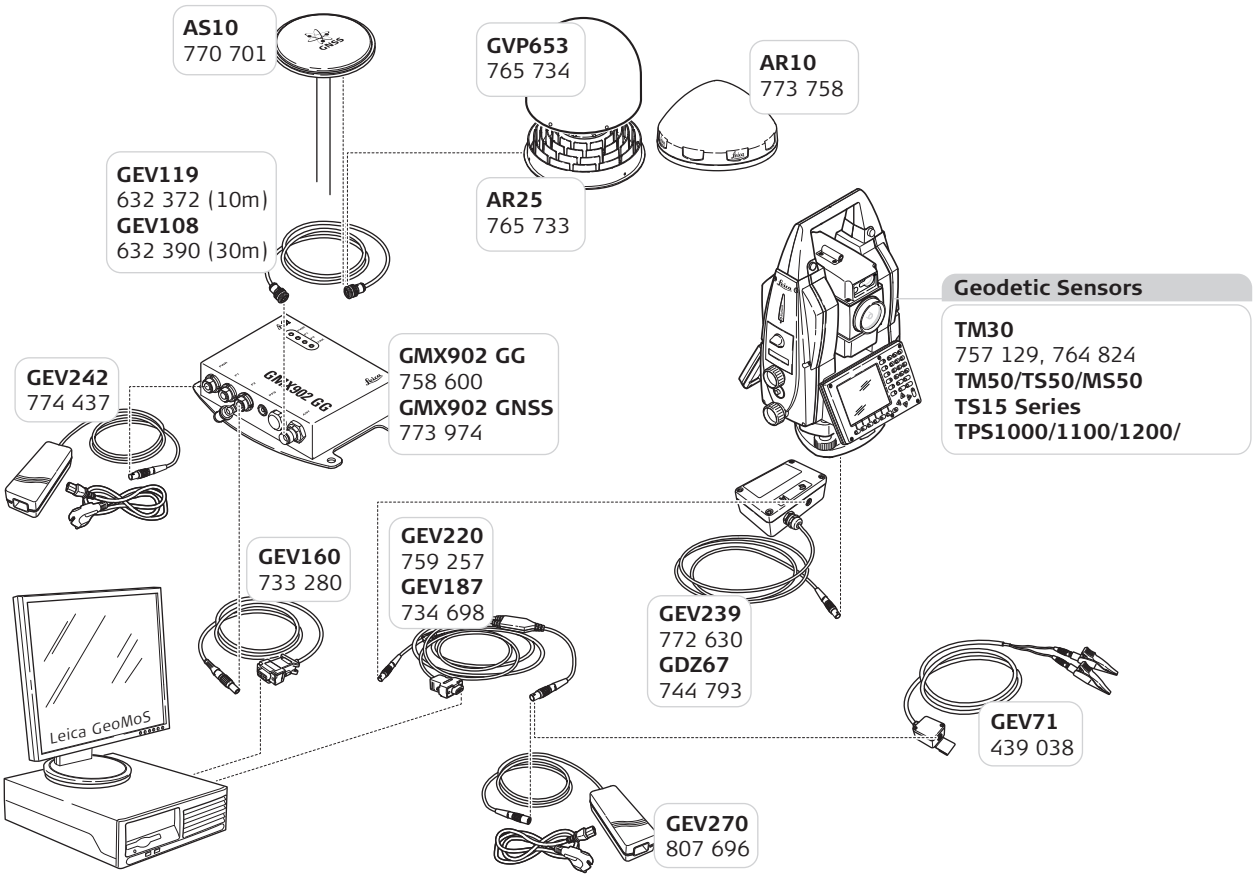
23.2 Total Station with Radio (GFU27)



23.3 Total Station with Radio (TCPS29)

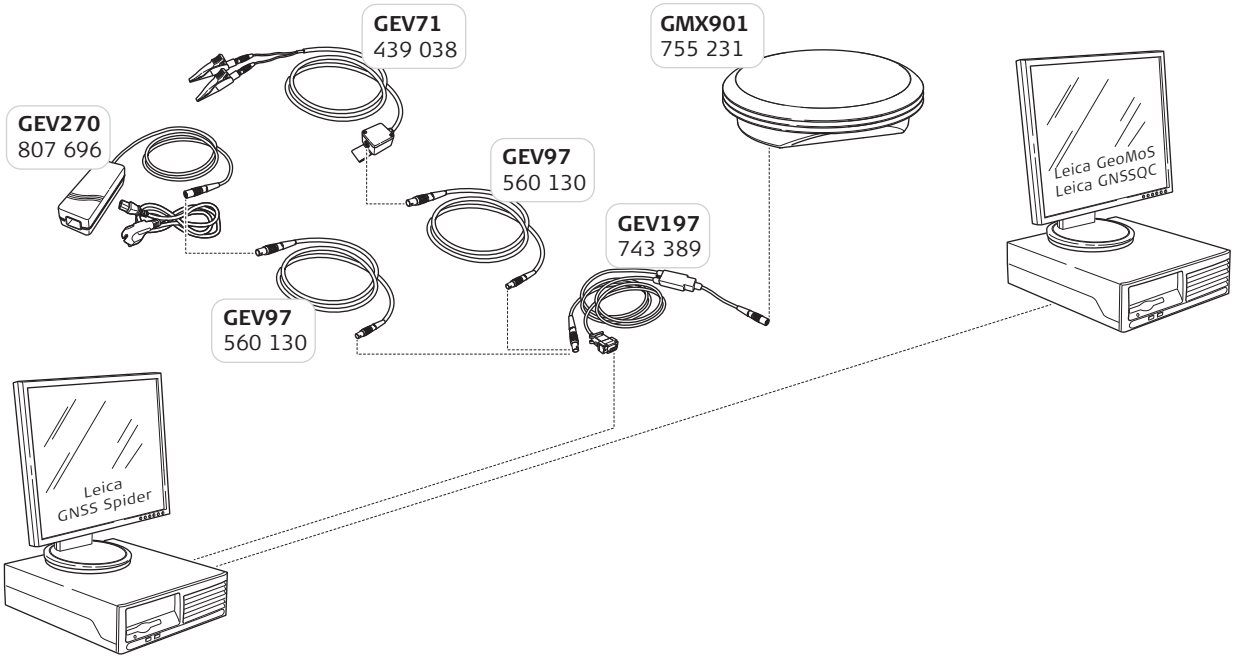


23.4 GNSS Sensor co-located with a Total Station

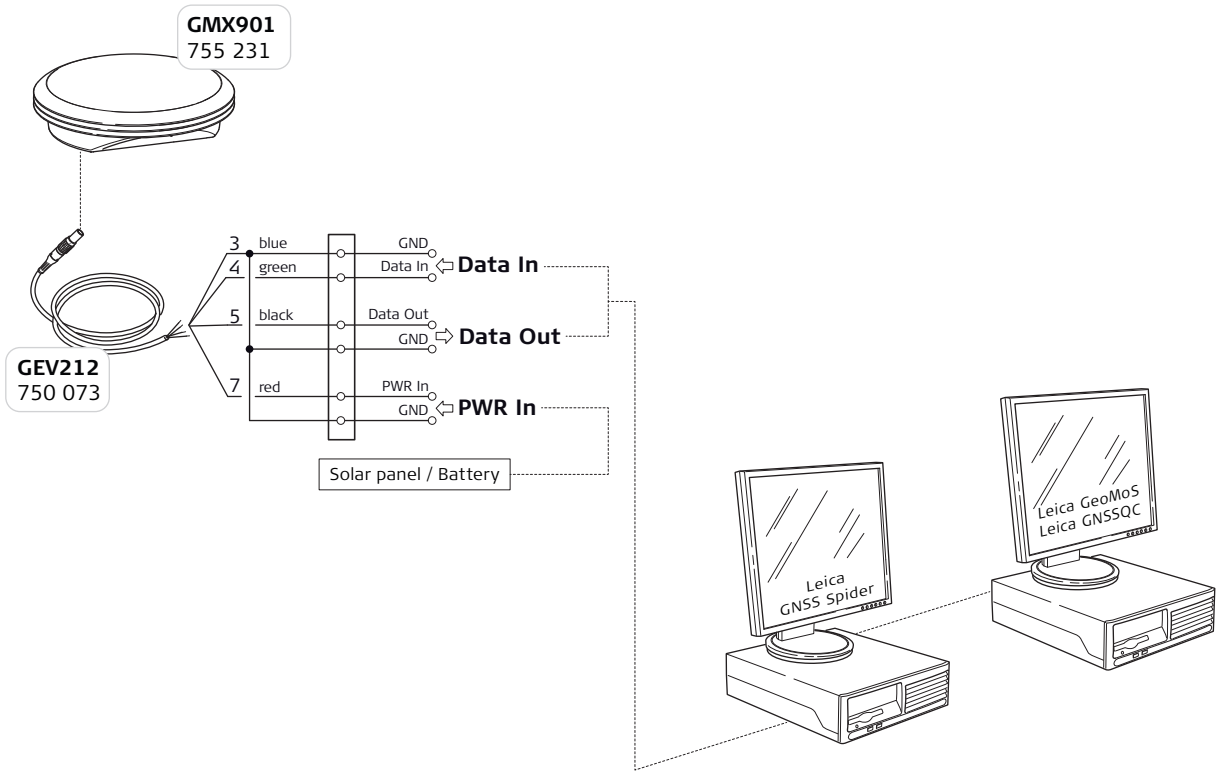


24 Setup of GNSS Sensors

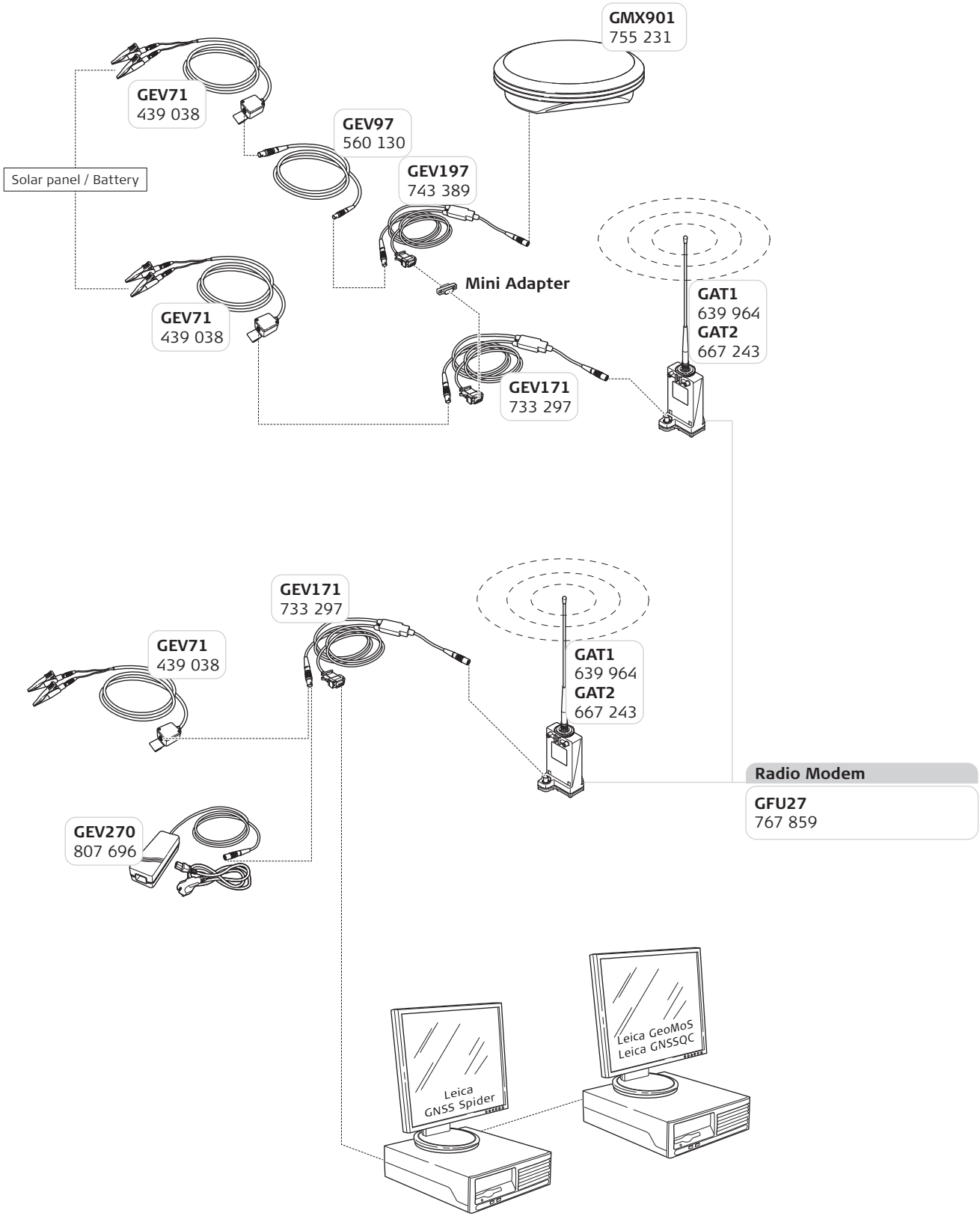
24.1 GMX901 Sensor with Standard Cables



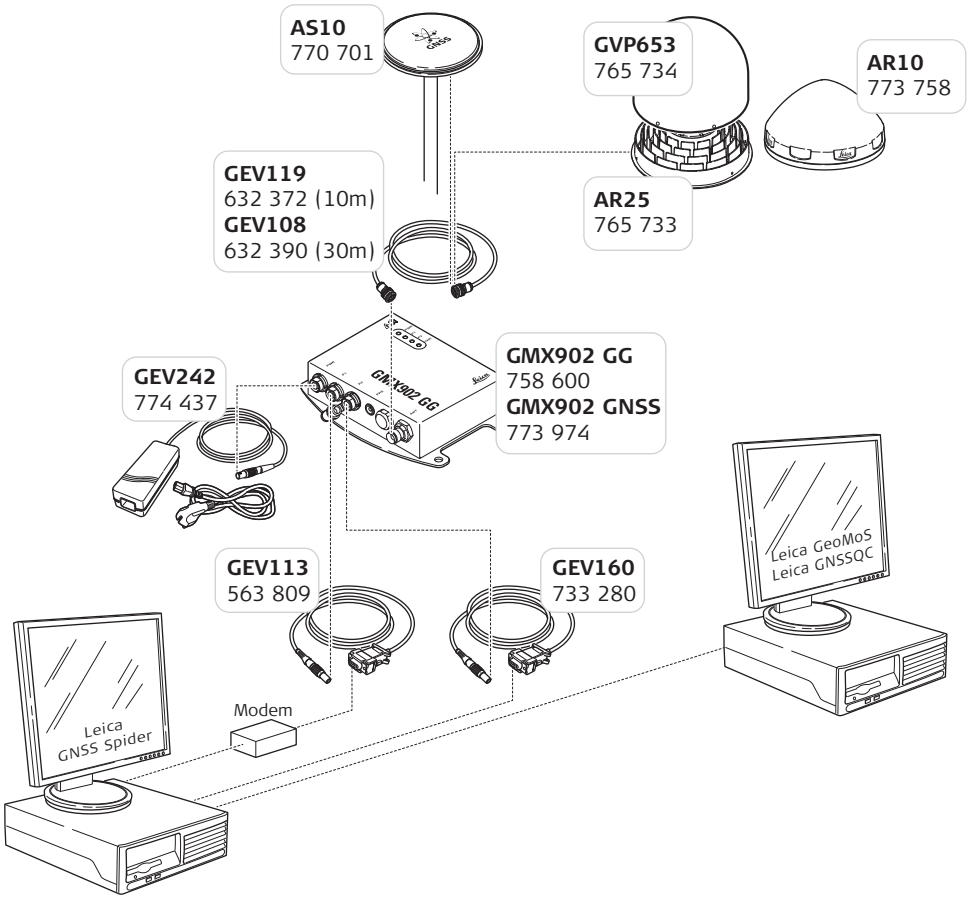
24.2 GMX901 Sensor with Custom Wired Cables



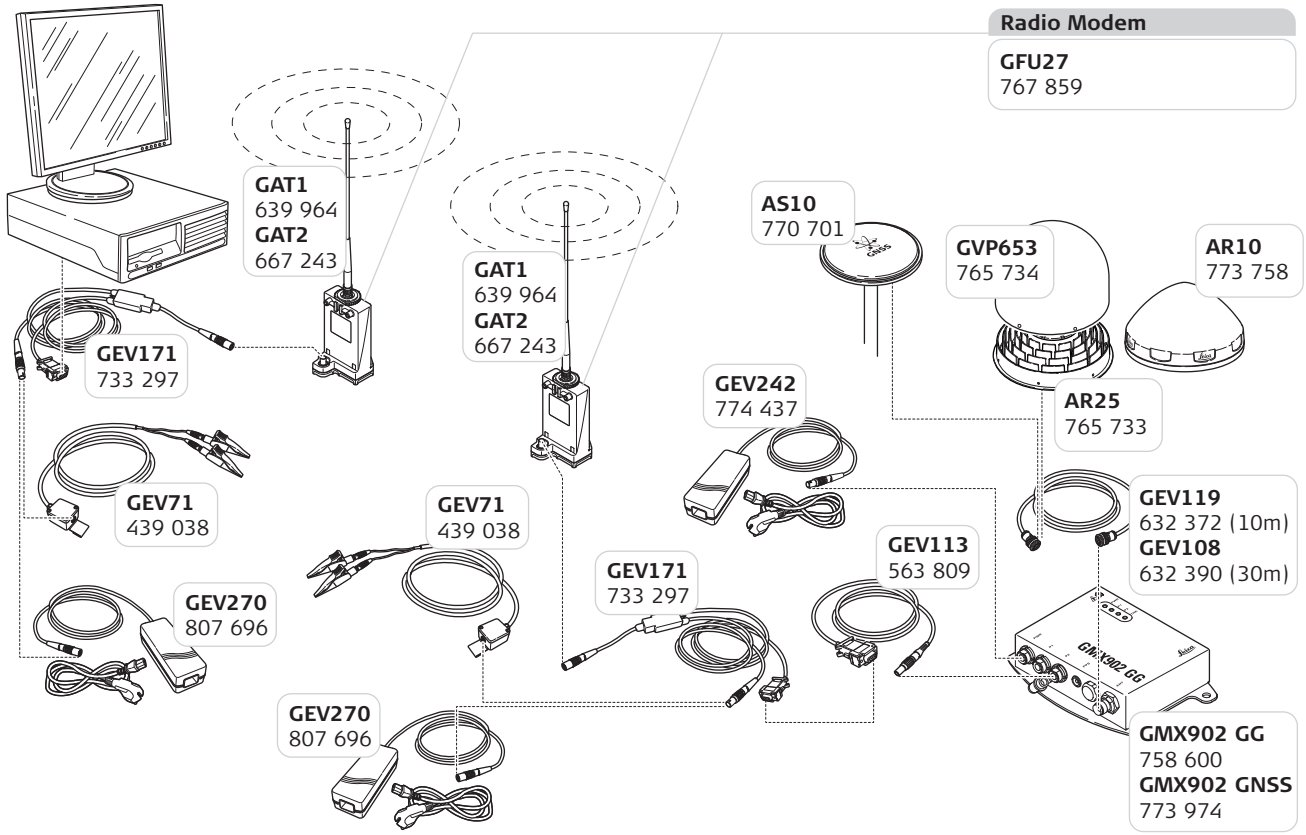
24.3 GMX901 Sensor with Radio (GFU27)



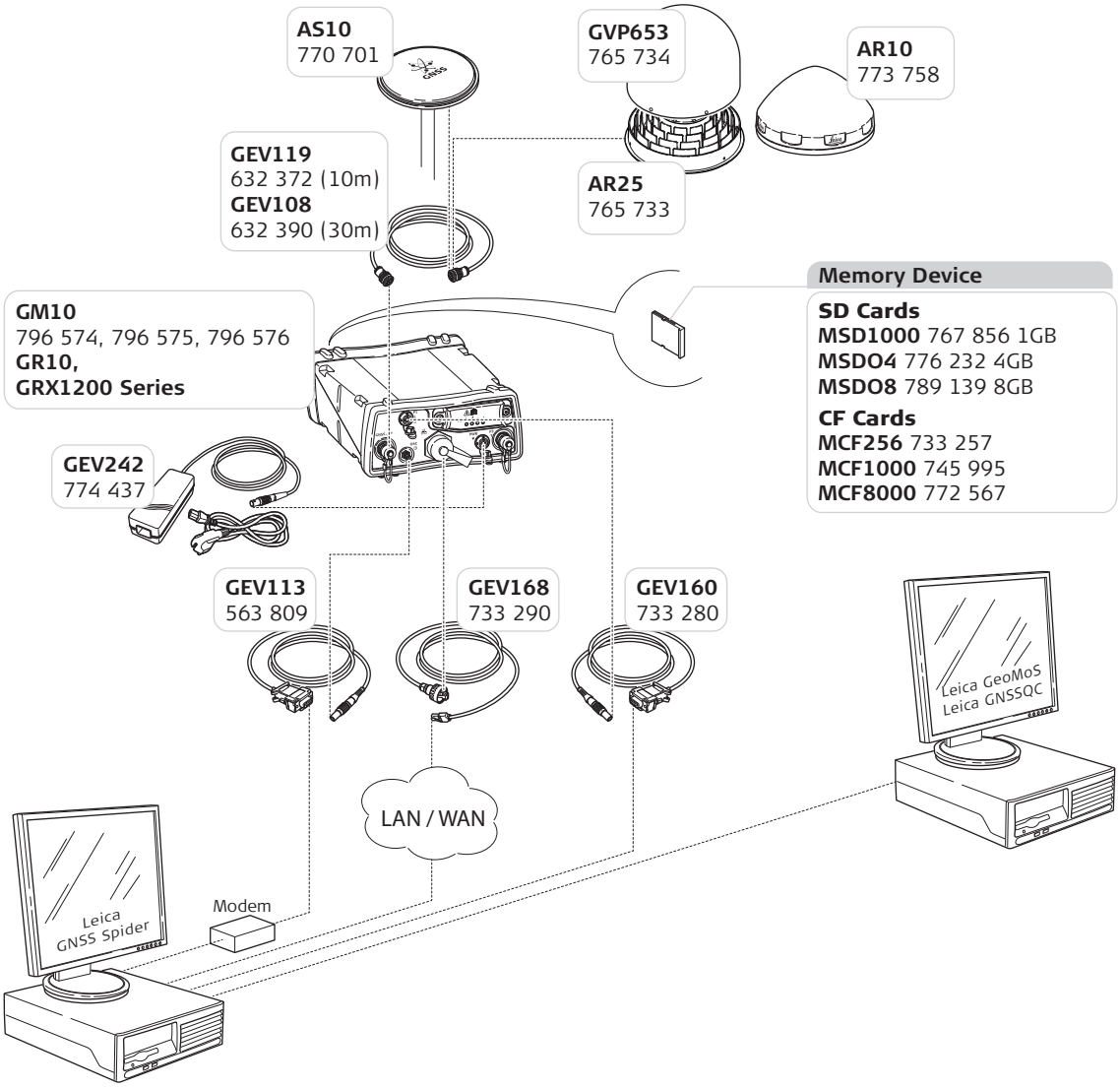
24.4 Real-time GNSS with GMX902 Sensors



24.5 GMX902 Sensor with Radio (GFU27)

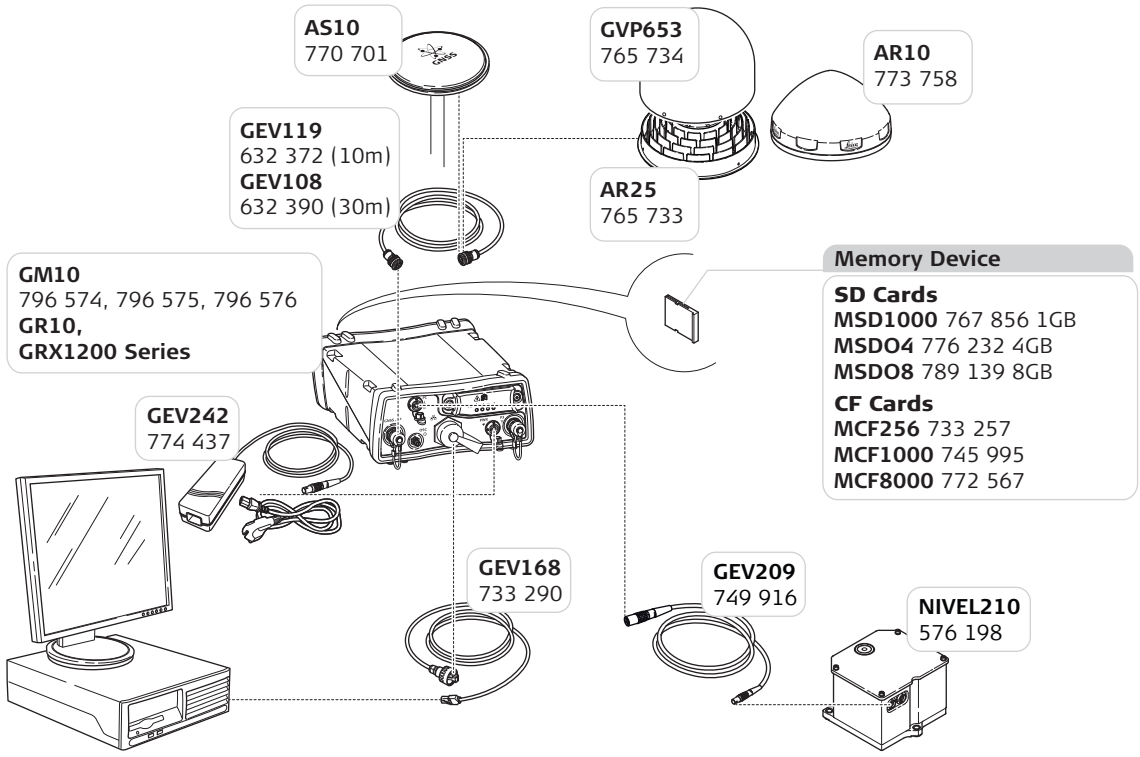


24.6 Setup of Post Processing GNSS with GR10/GM10/GRX1200Pro Sensors

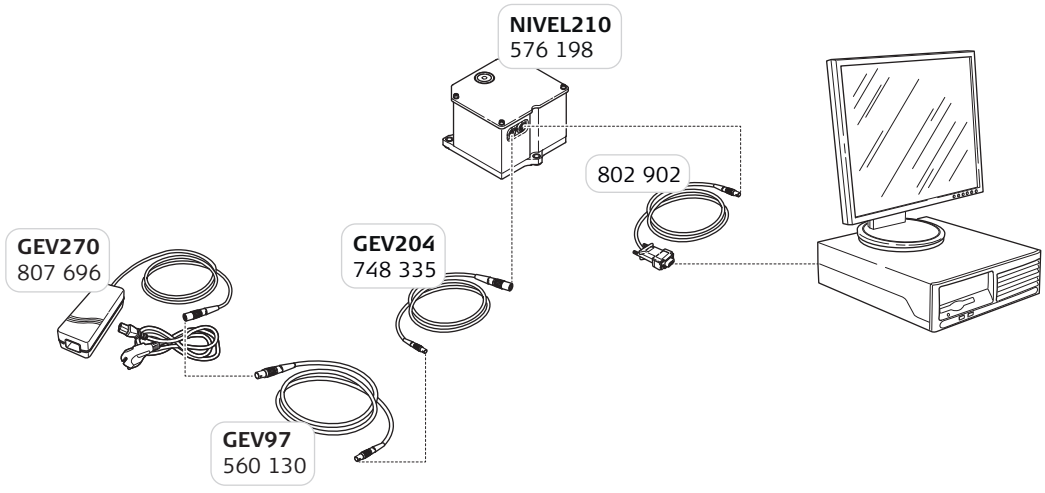


25 Setup of a NIVEL

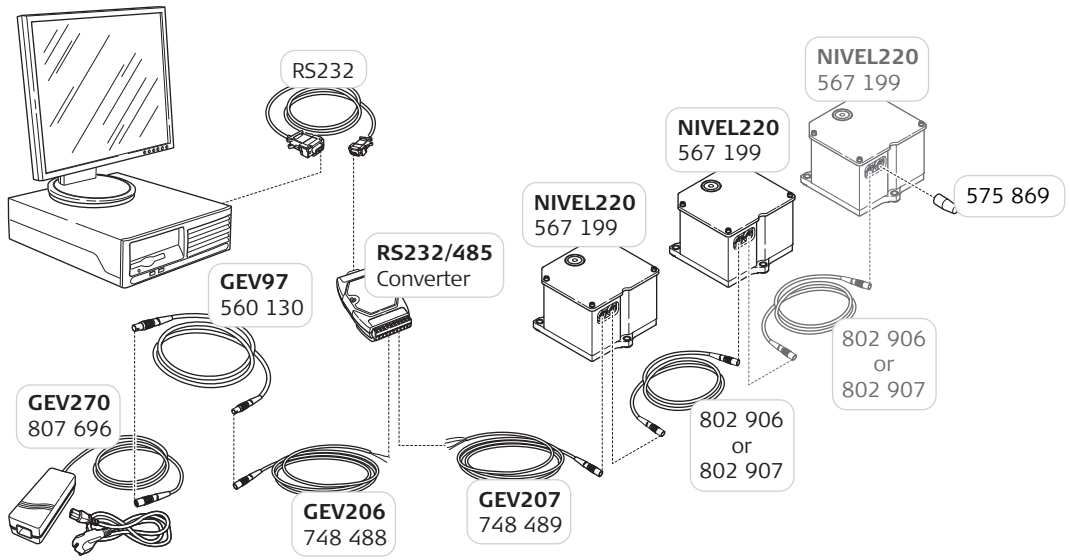
25.1 Setup of a Nivel210 with GR10/GM10/GRX1200Pro Series



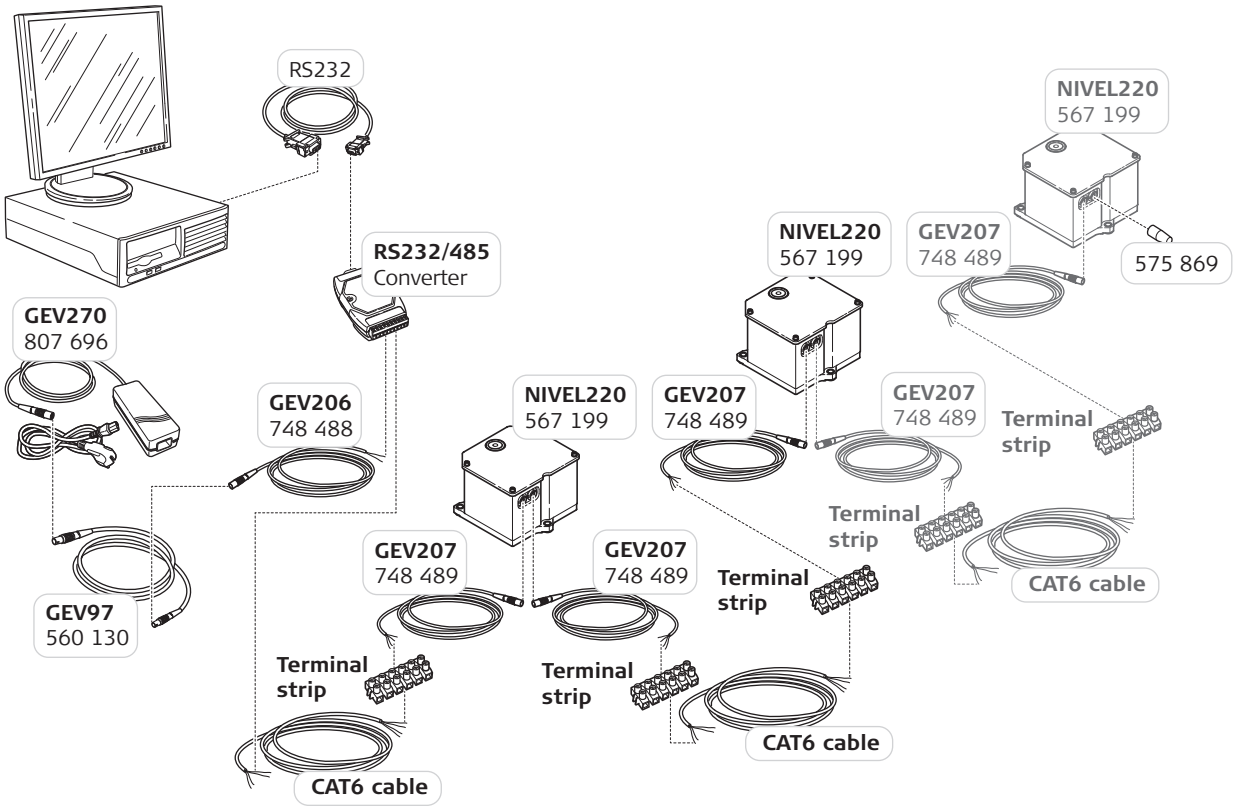
25.2 Setup of a Nivel210 (RS232)



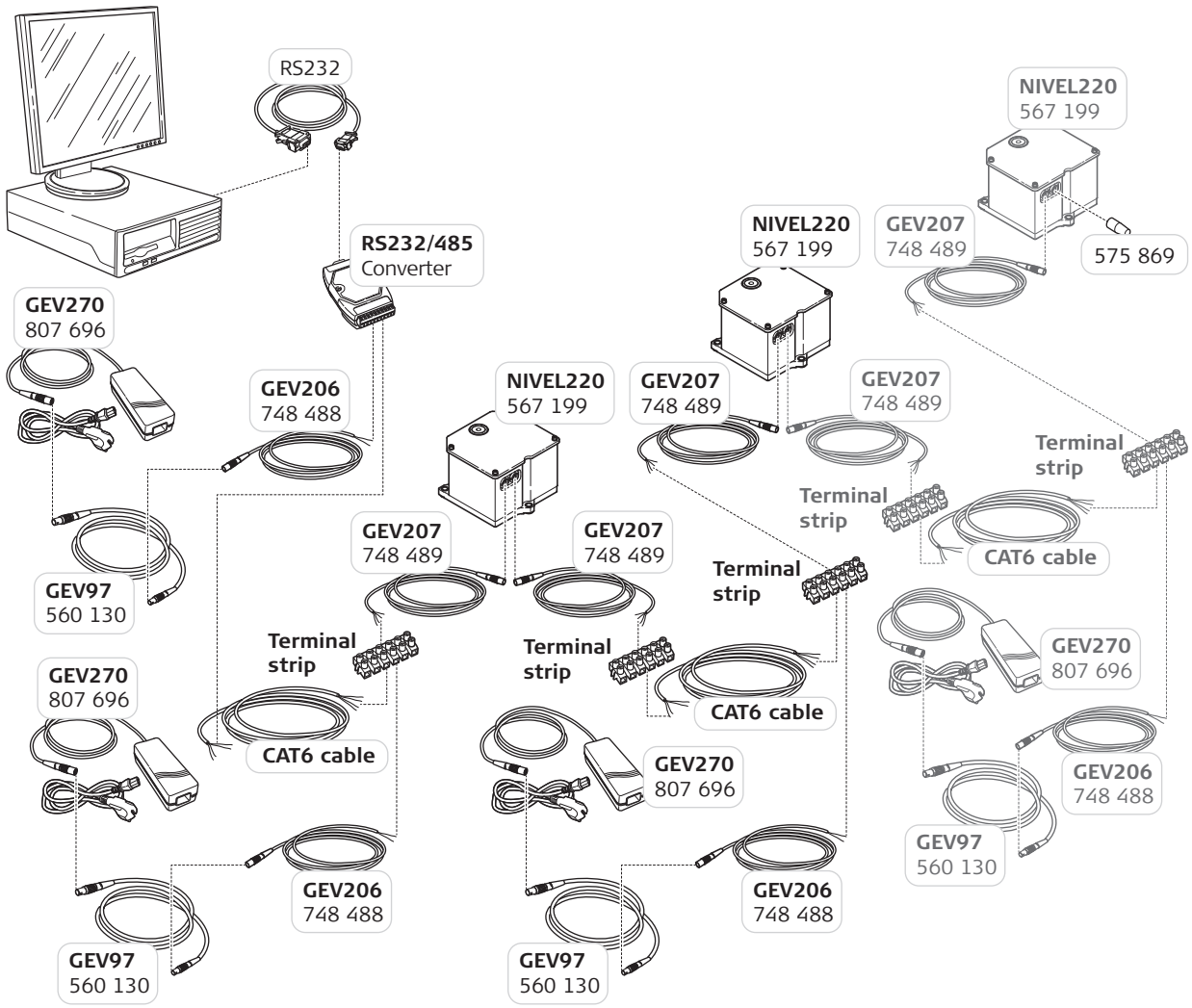
25.3 Setup of a Nivel220 (RS485) with Leica Cables



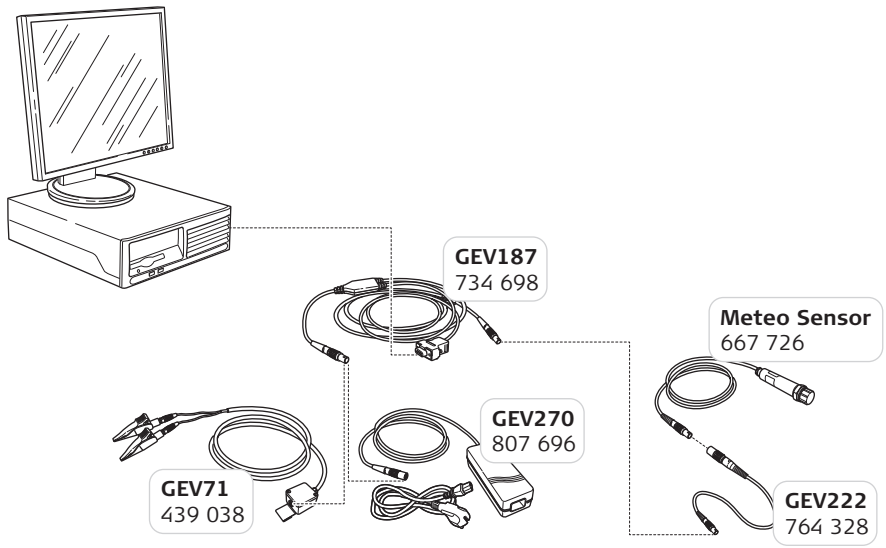
25.4 Nivel220 (RS485) with Long Cables, Single Power Source



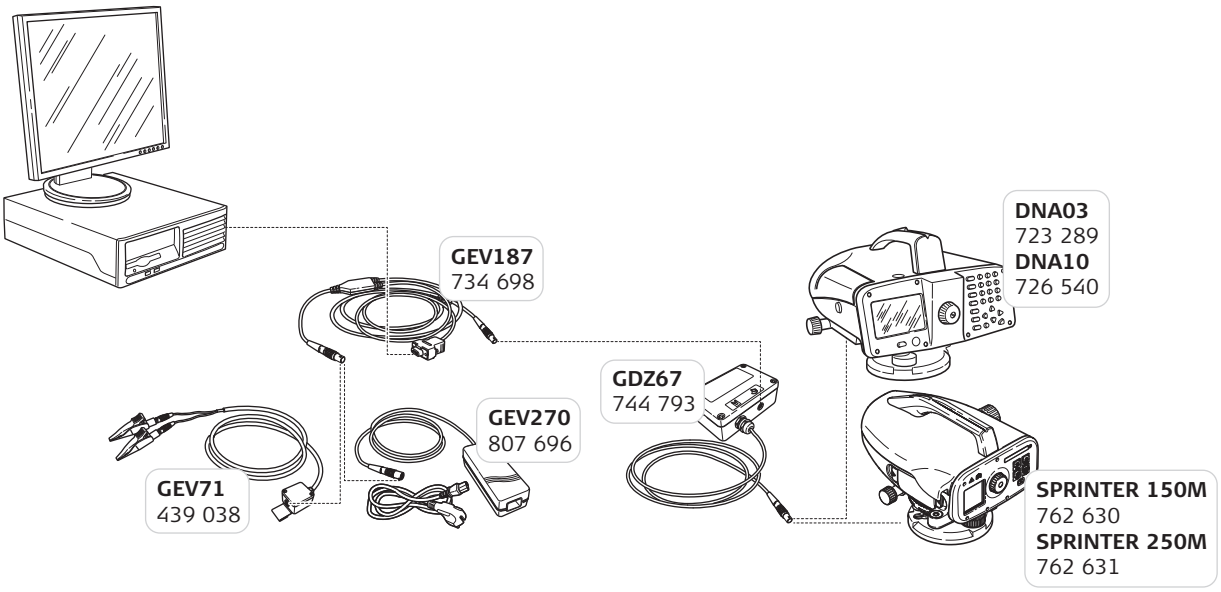
25.5 Nivel220 (RS485) with Long Cables, Multiple Power Sources



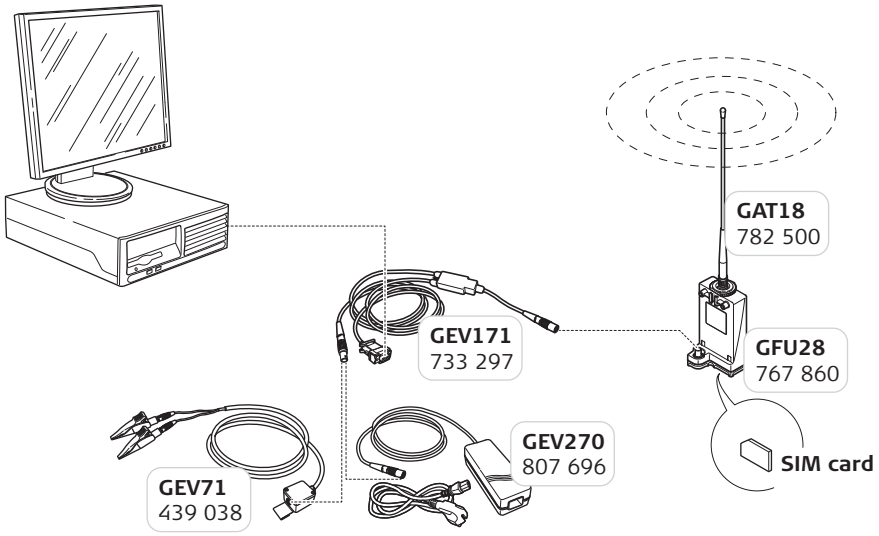
26 Setup of a Meteo Sensor



27 Setup of a Level

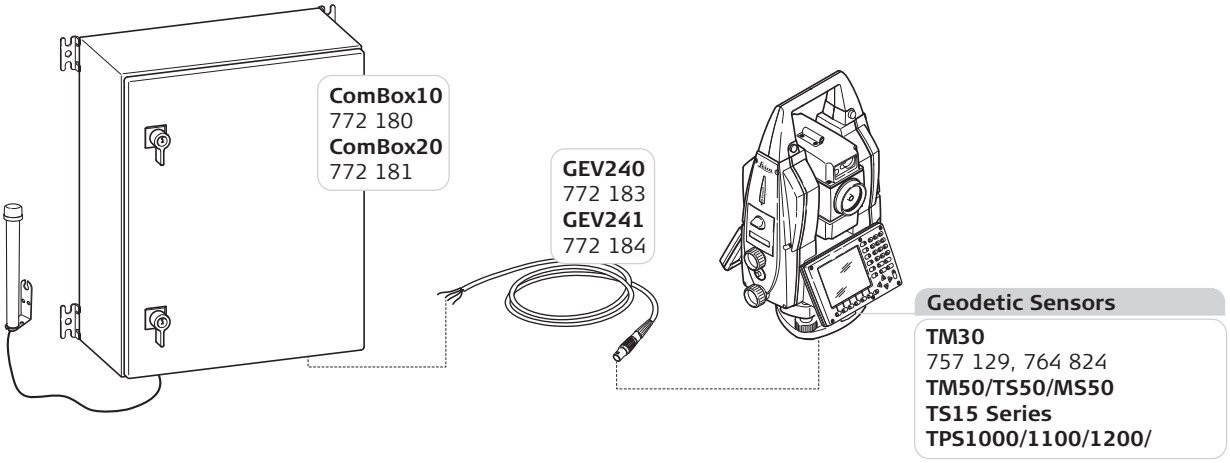


28 Setup of a MC75

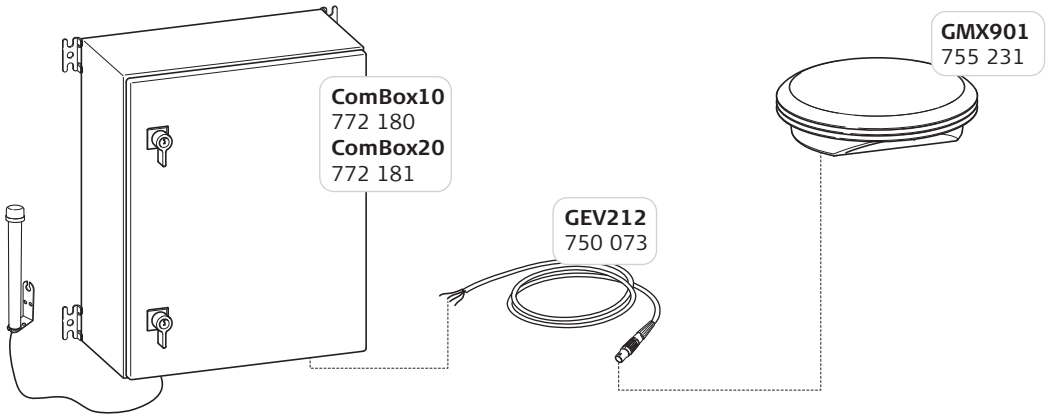


29 Setup M-Com

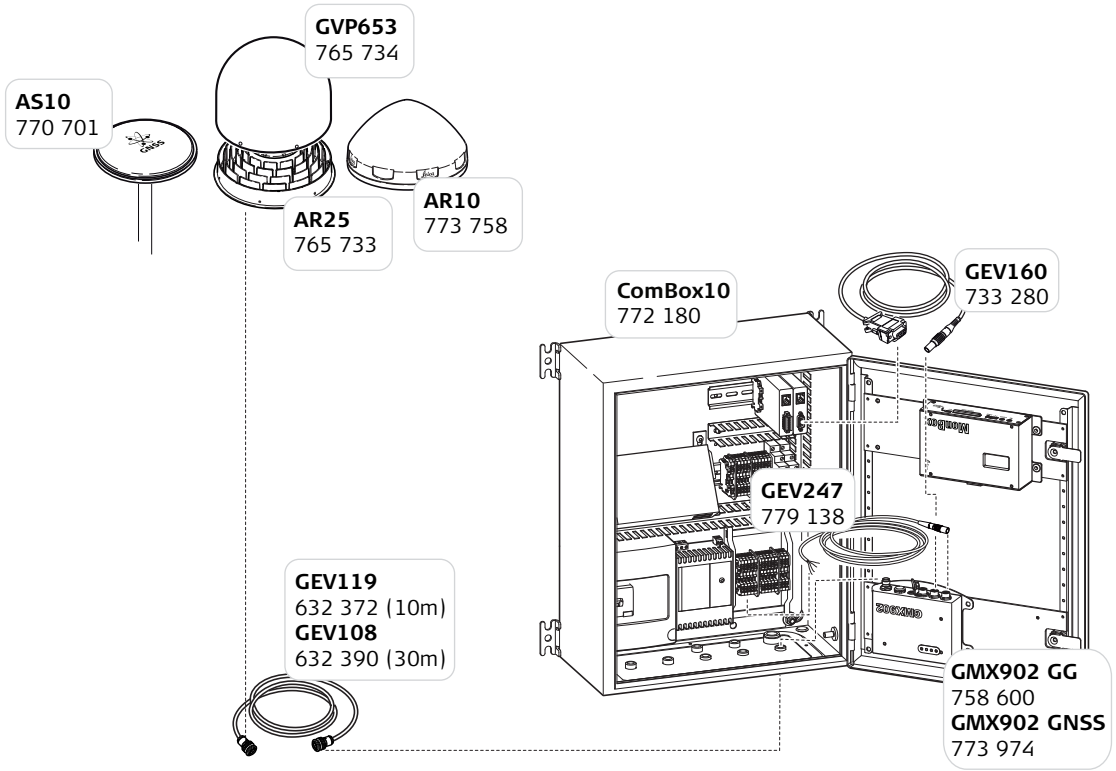
29.1 ComBox with a Total Station



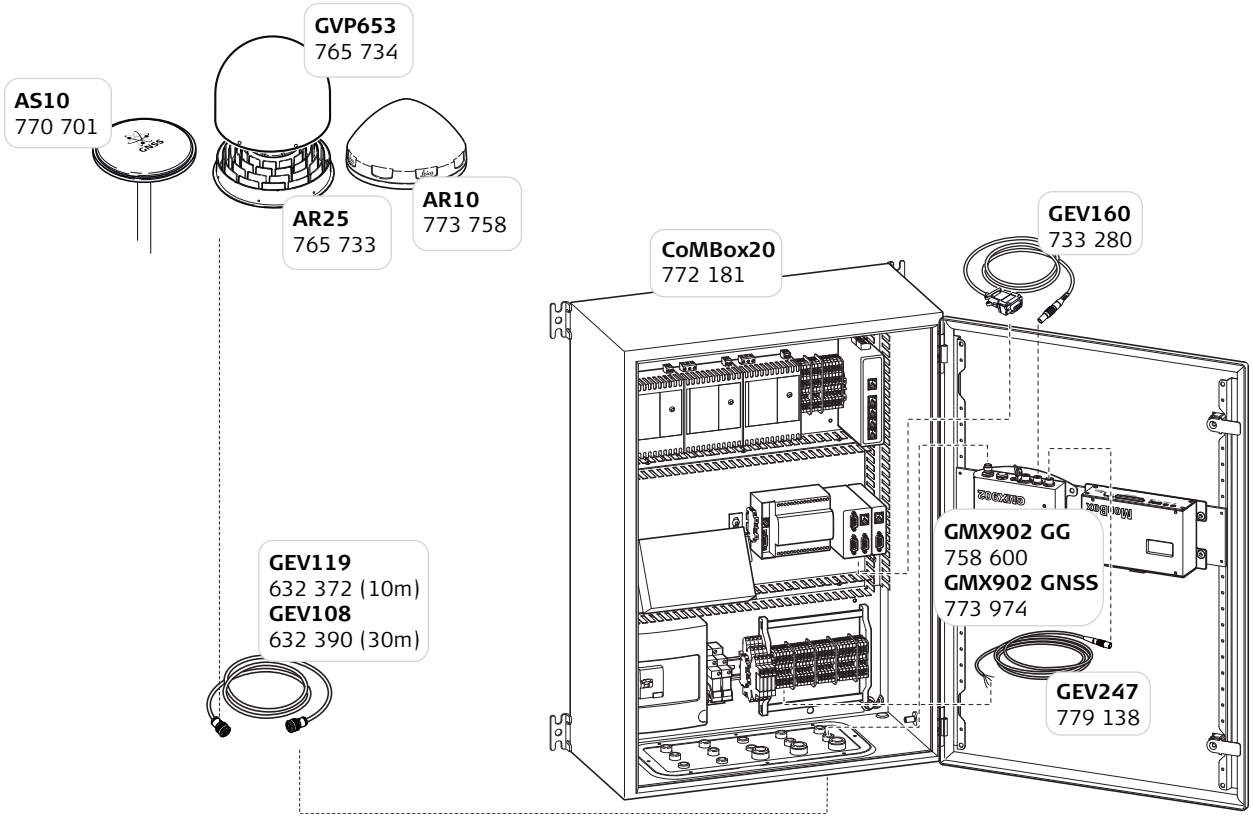
29.2 ComBox with a GMX901 Sensor



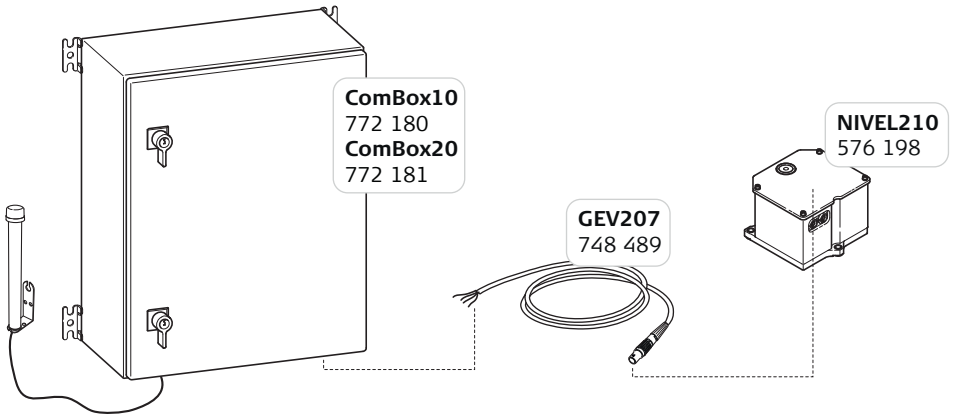
29.3 ComBox10 with a GMX902 Sensor



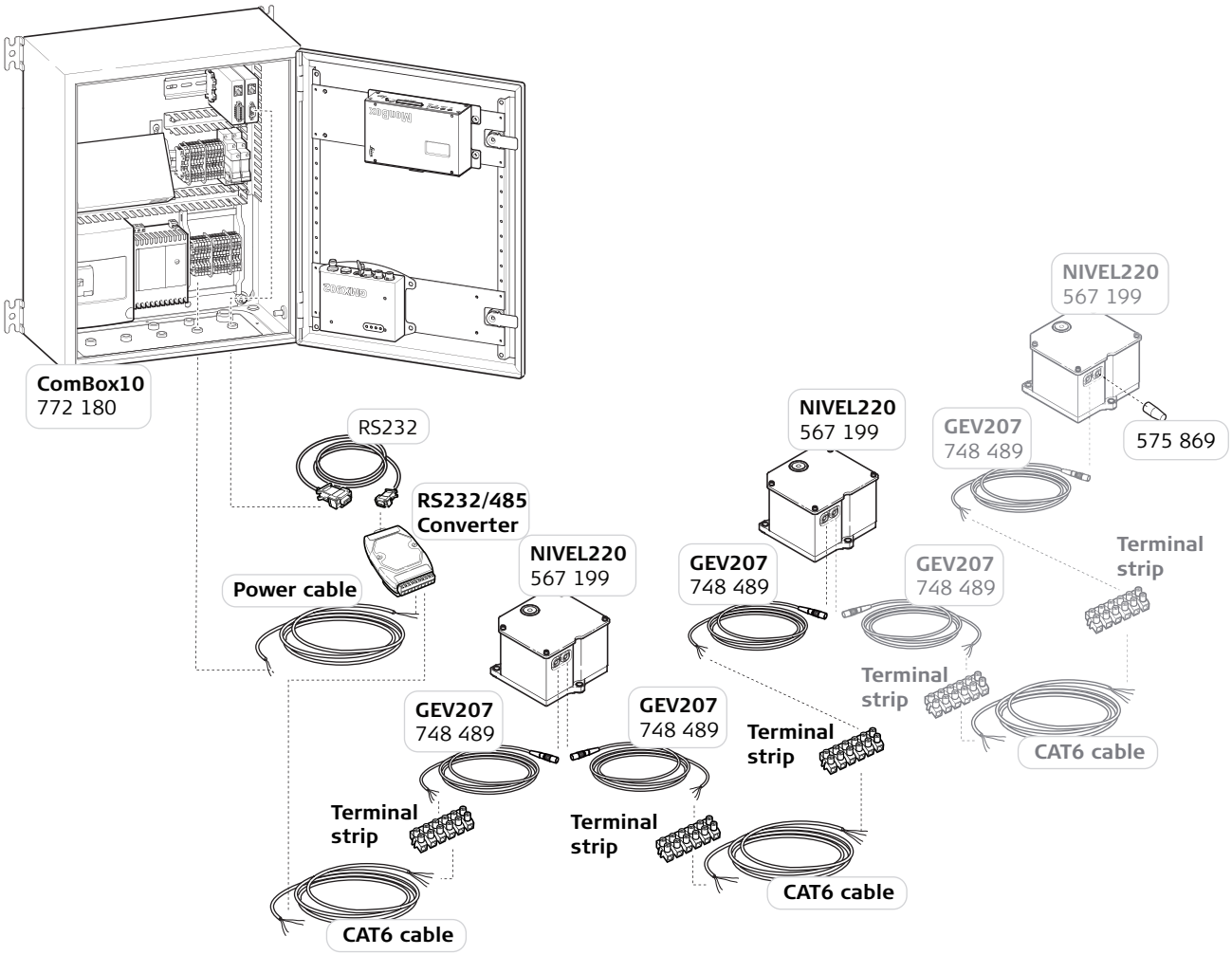
29.4 ComBox20 with a GMX902 Sensor



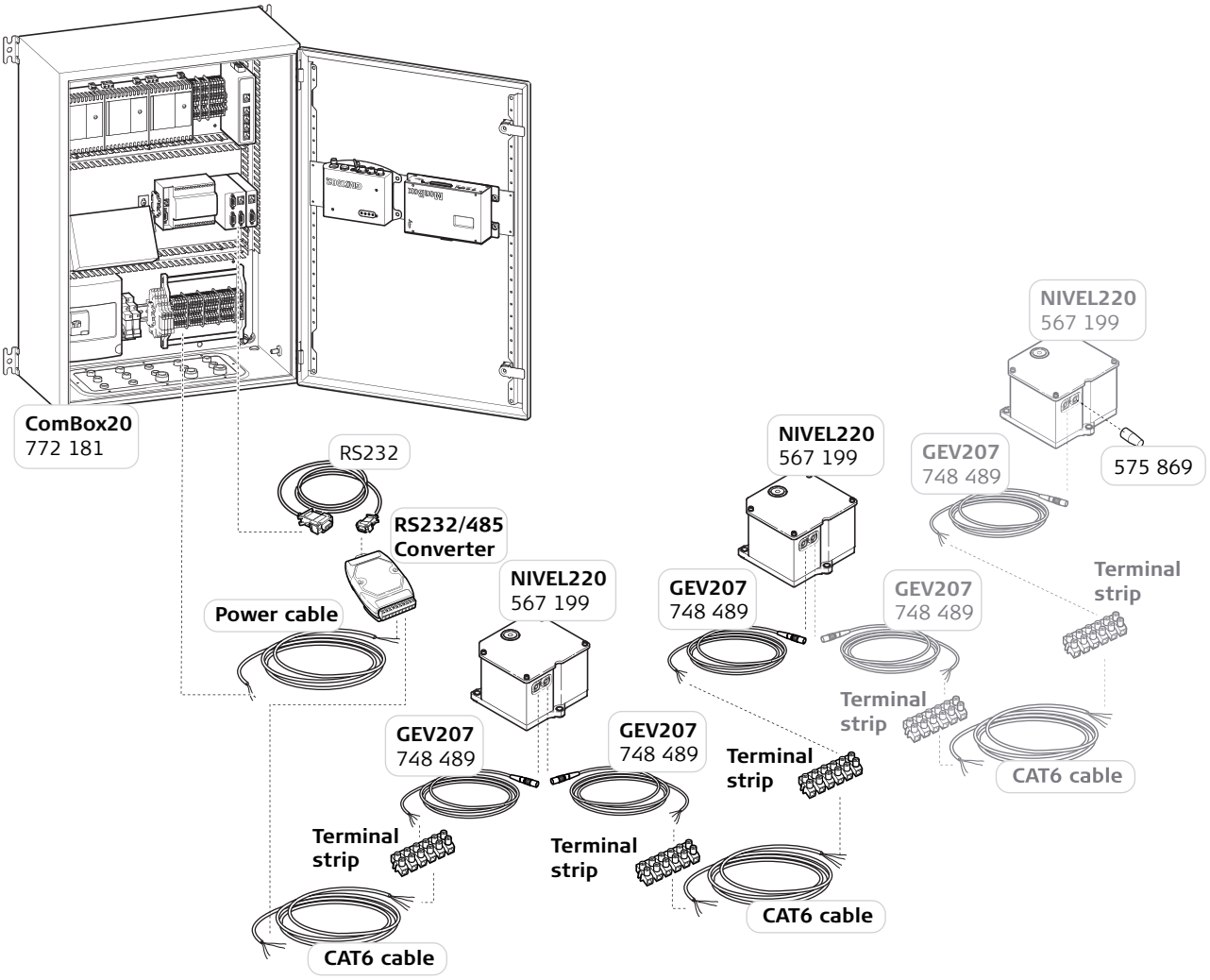
29.5 ComBox with a Nivel210 (RS232)



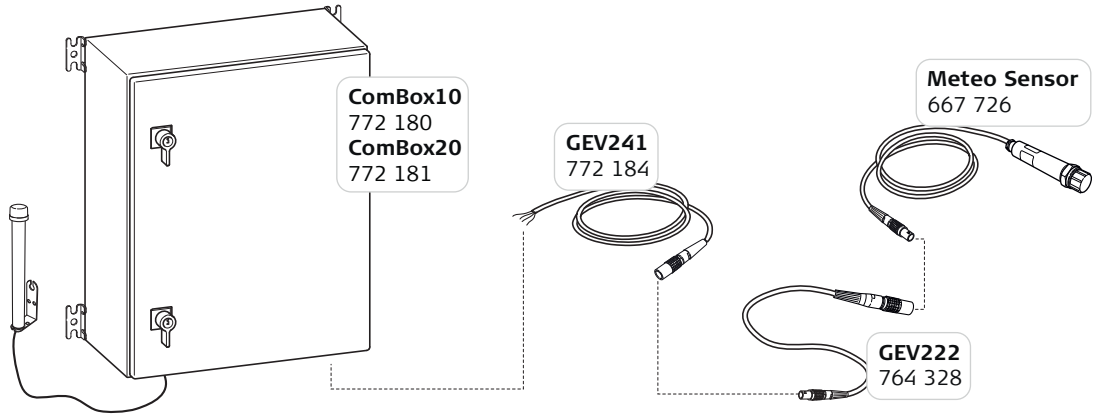
29.6 ComBox10 with a Nivel220 (RS485)



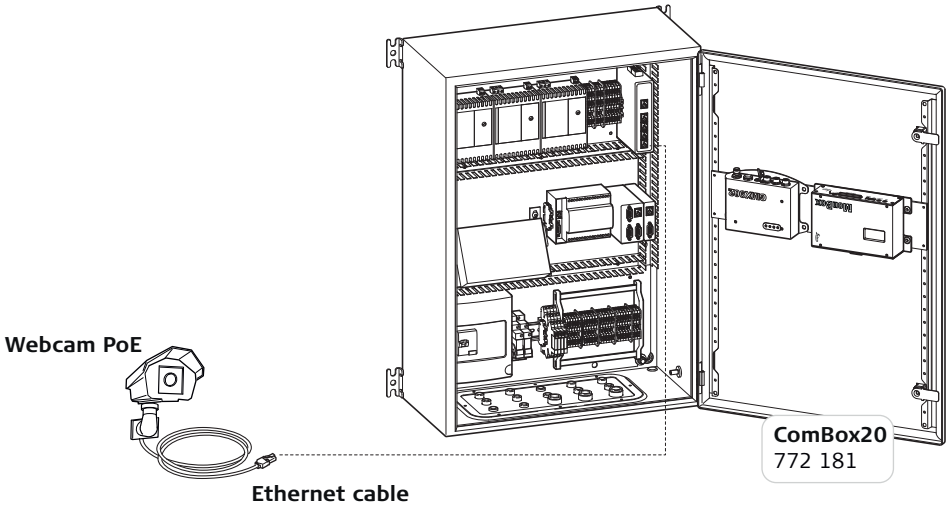
29.7 ComBox20 with a Nivel220 (RS485)



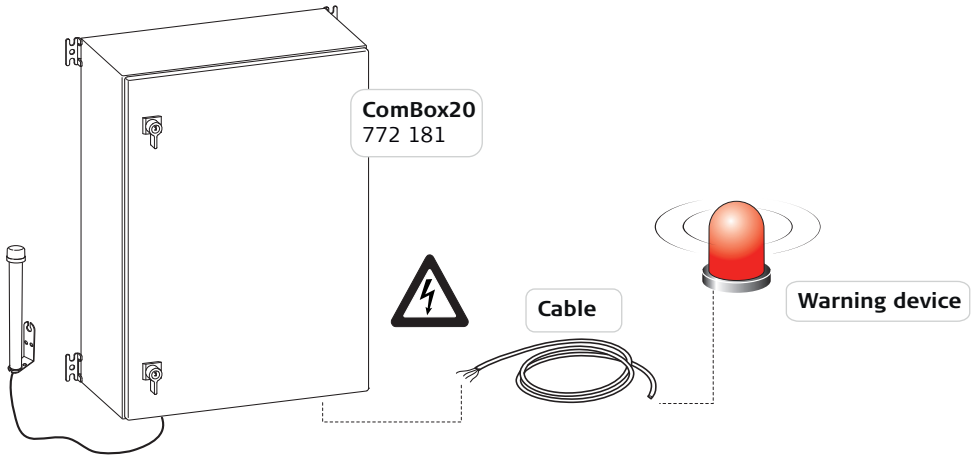
29.8 ComBox with a Meteo Sensor



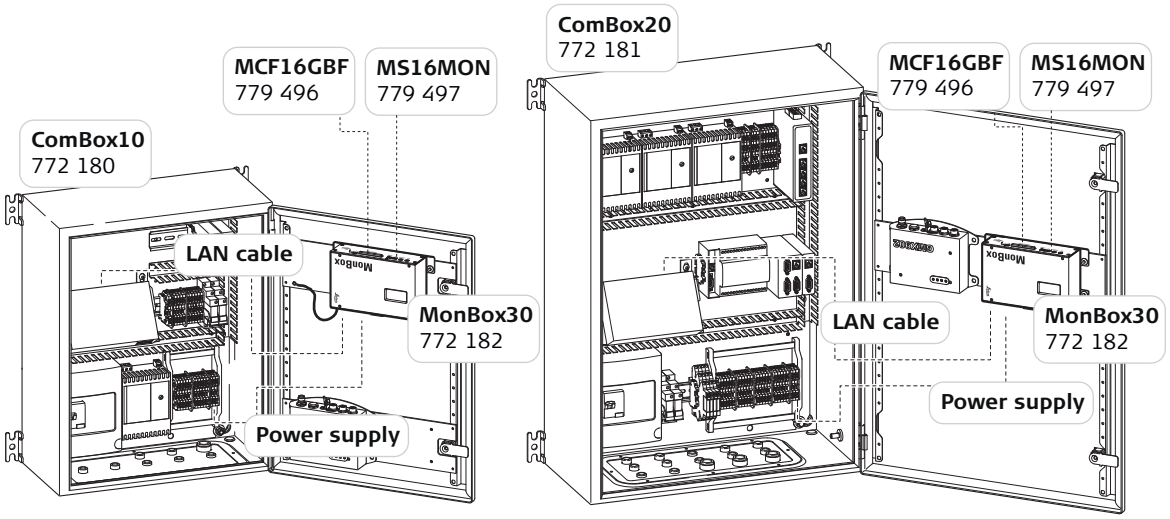
29.9 ComBox20 with a Webcam Powered over Ethernet (PoE)



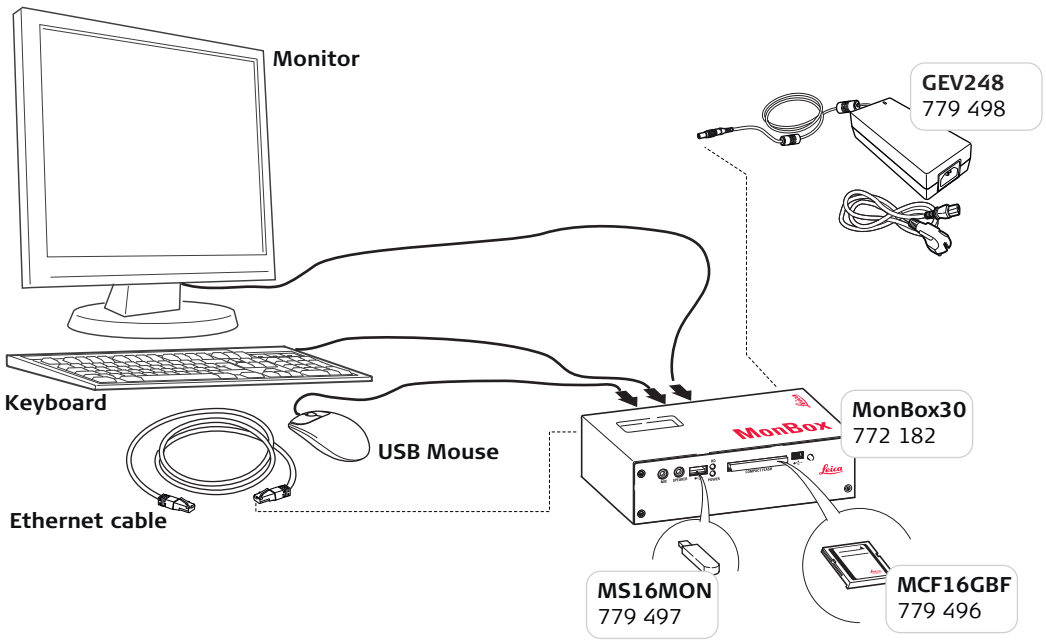
29.10 ComBox20 with a Warning Device



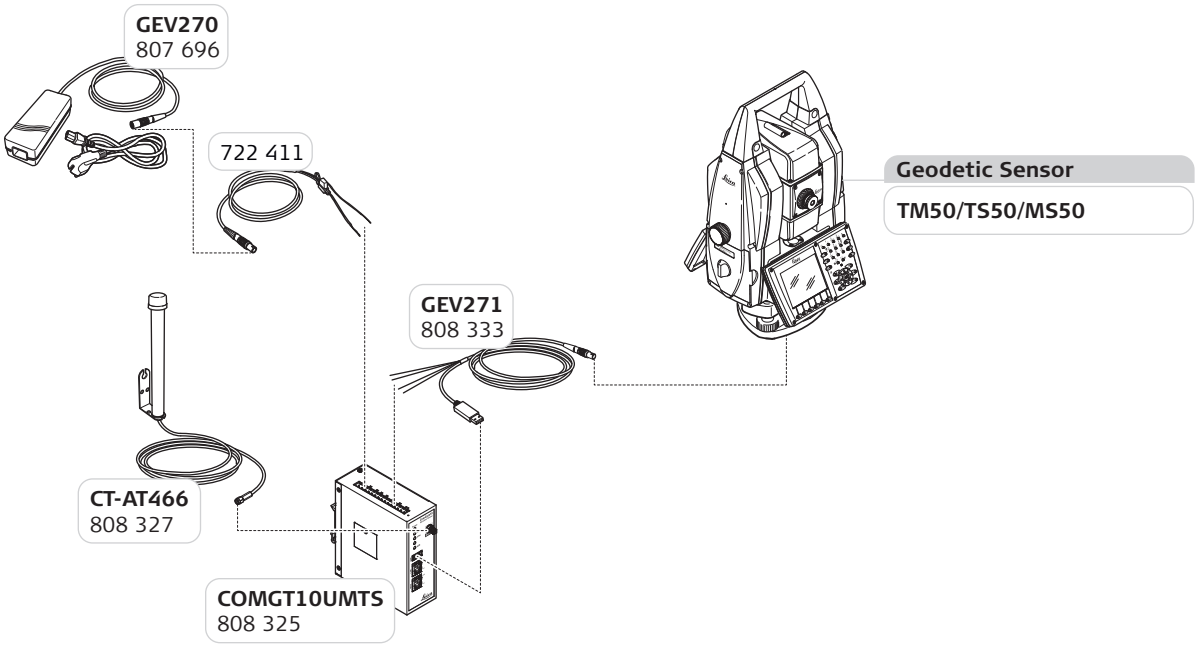
29.11 MonBox with a ComBox



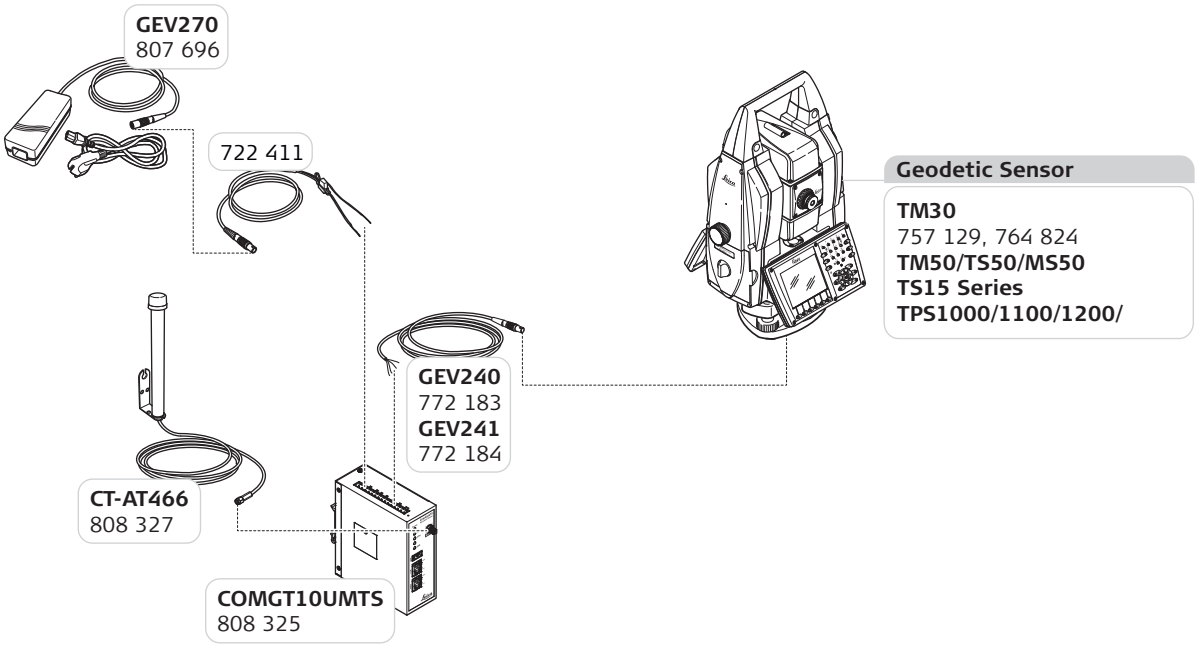
29.12 Setup of a stand-alone MonBox



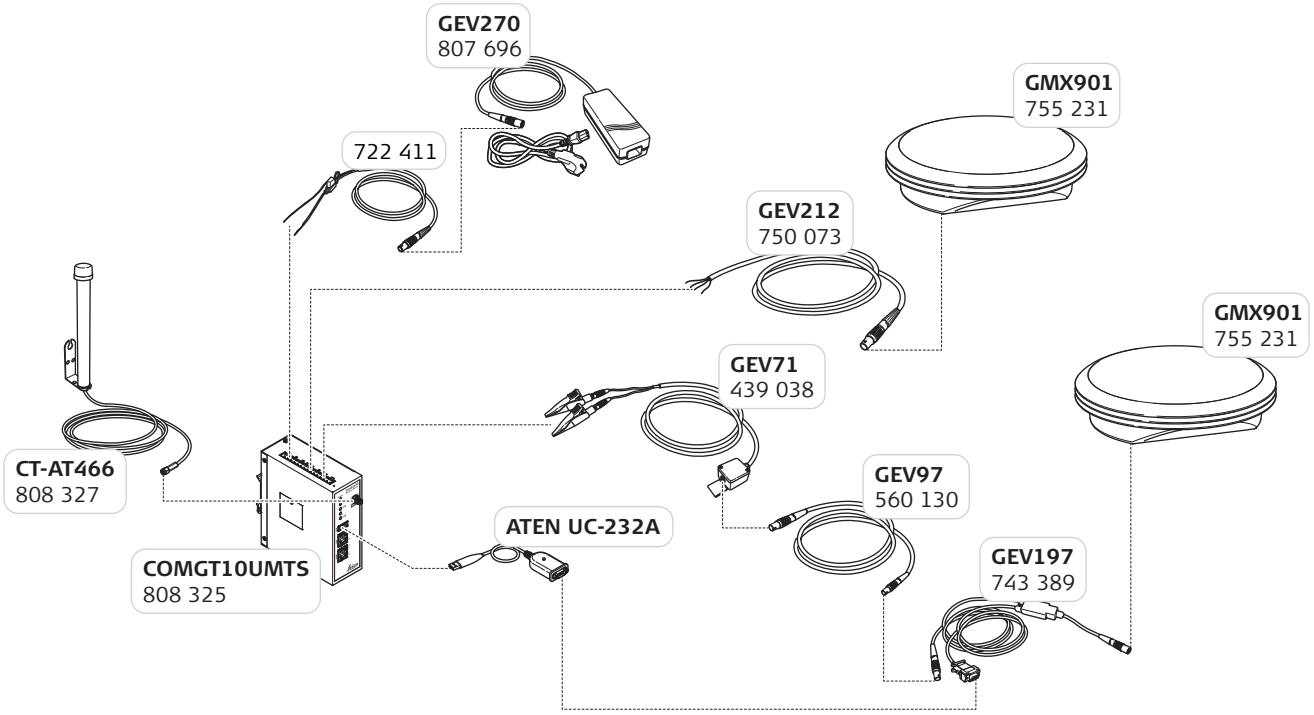
29.13 Setup of ComGate10 with a TM50/TS50/MS50 (USB Connection)



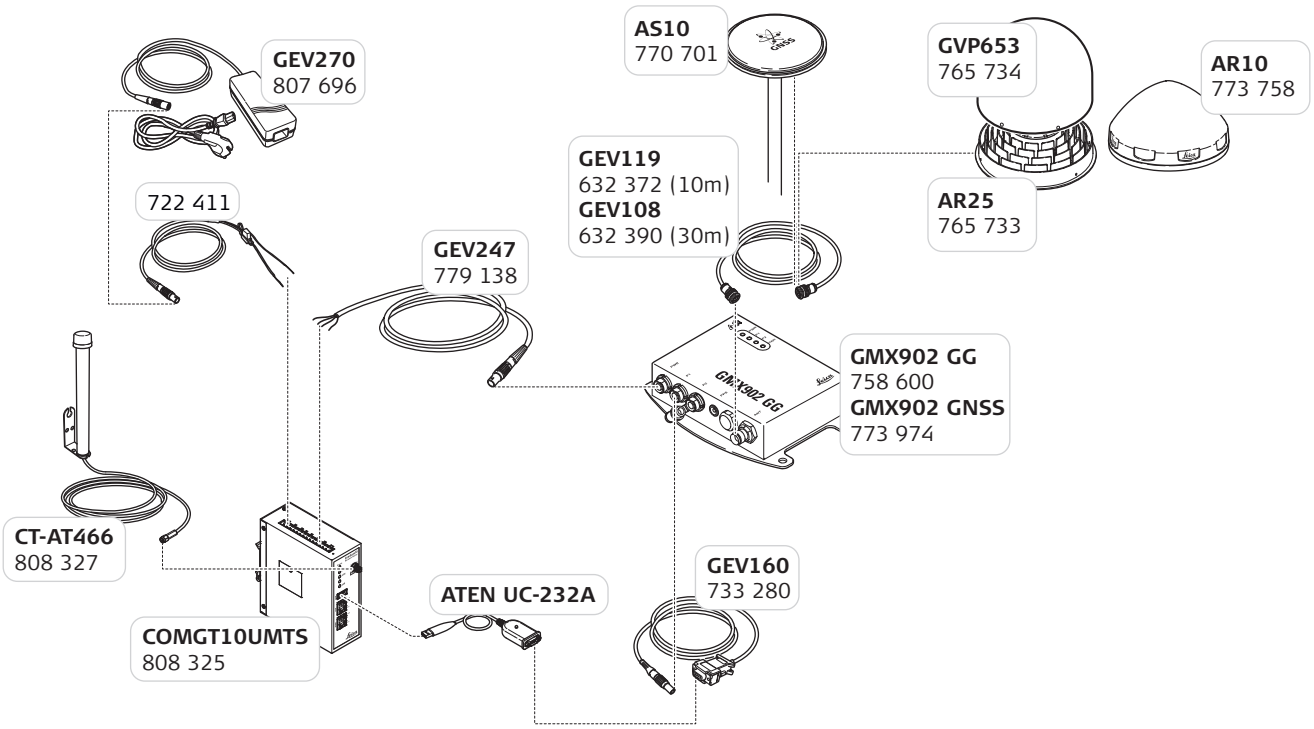
29.14 Setup of ComGate10 with a Total Station



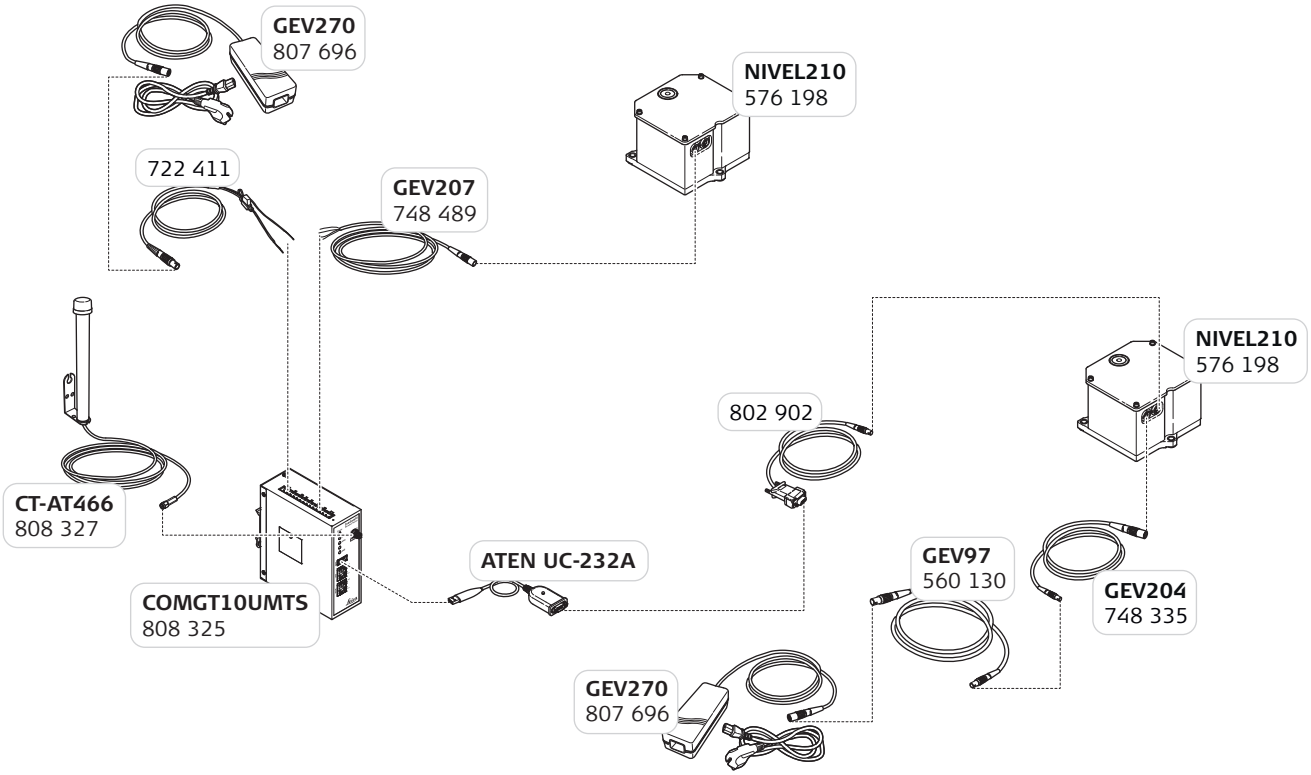
29.15 Setup of ComGate10 with a GMX901 Sensor



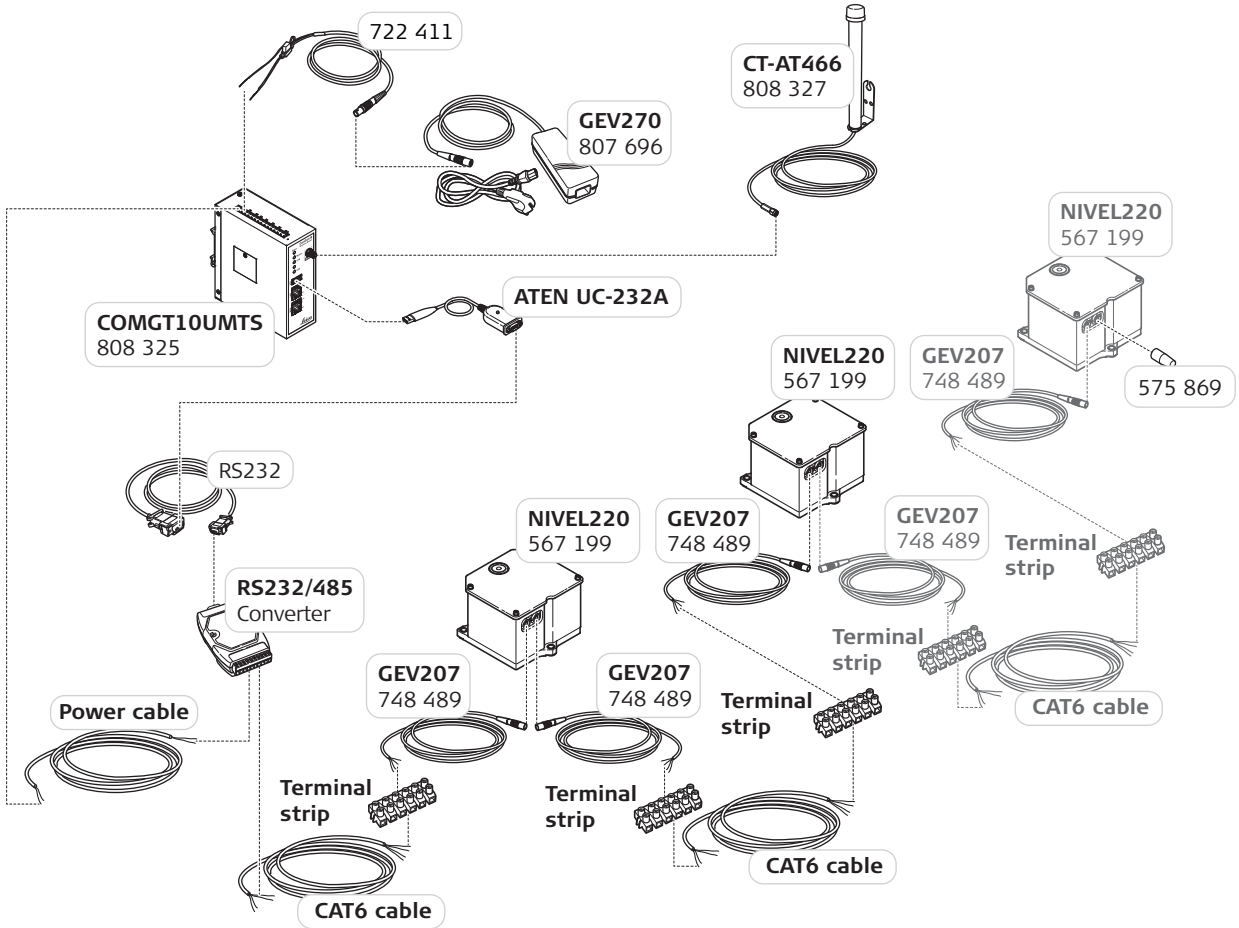
29.16 Setup of ComGate10 with a GMX902 Sensor



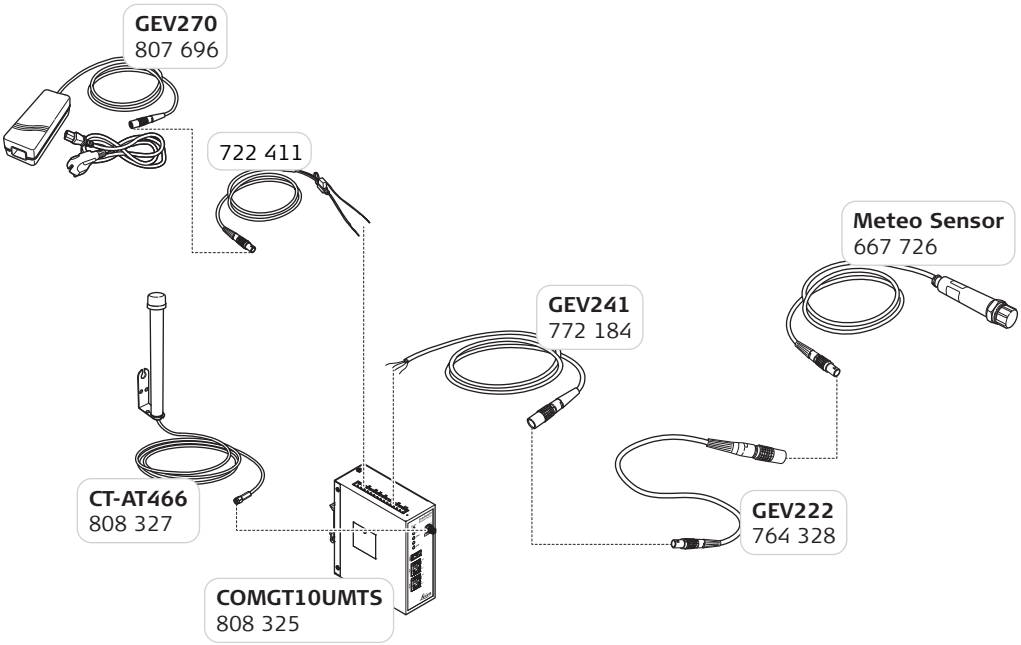
29.17 Setup of ComGate10 with a Nivel210 (RS232)



29.18 Setup of ComGate10 with a Nivel220 (RS485)

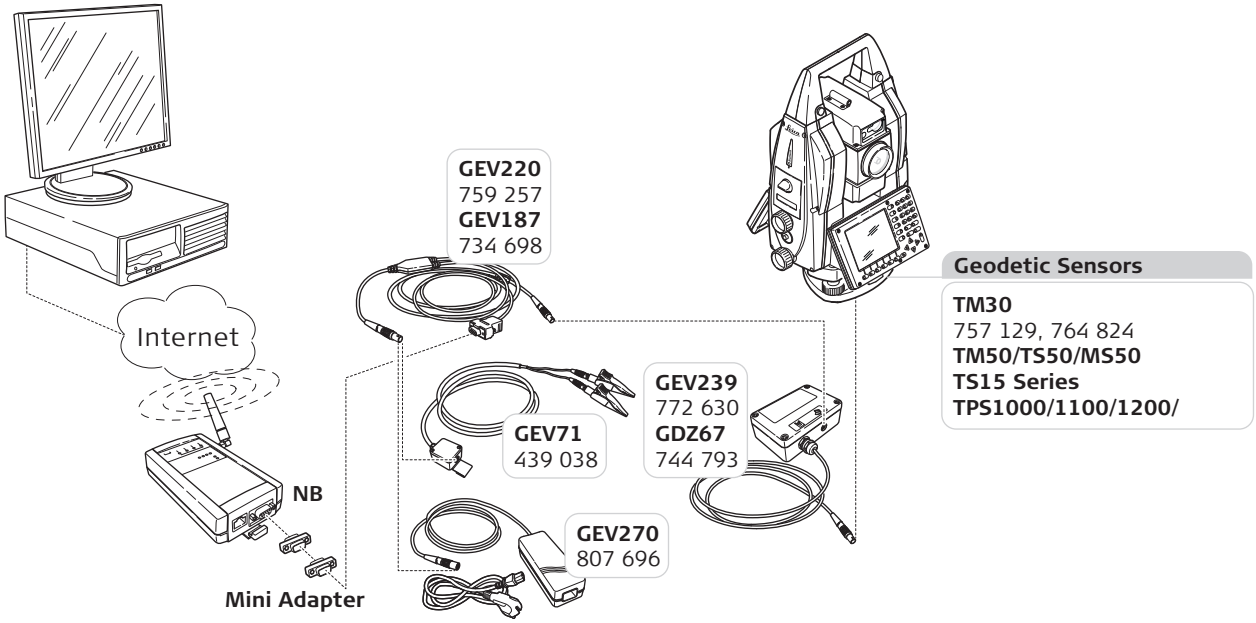


29.19 Setup of ComGate10 with a Meteo Sensor

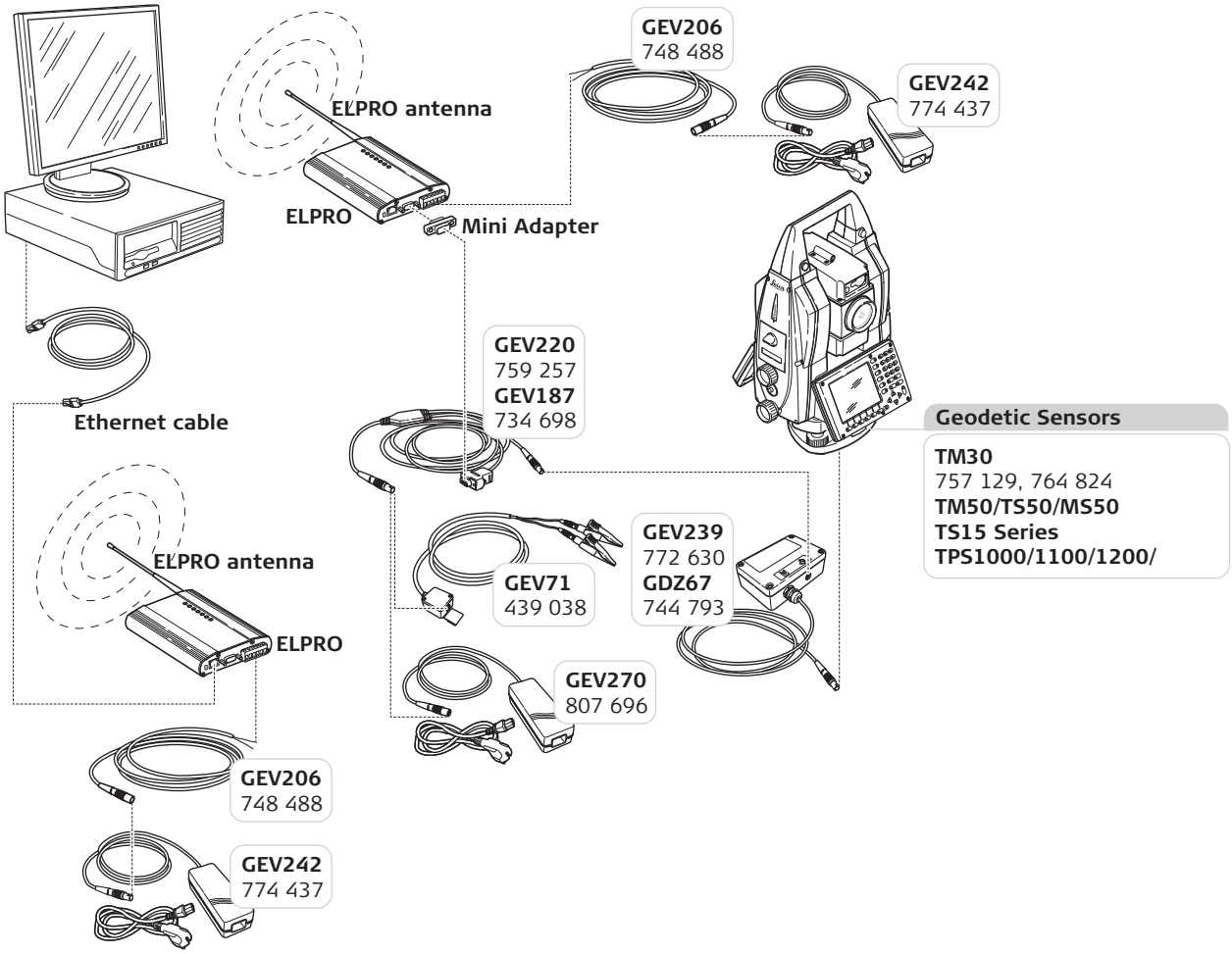


30 Setup of Third Party Devices

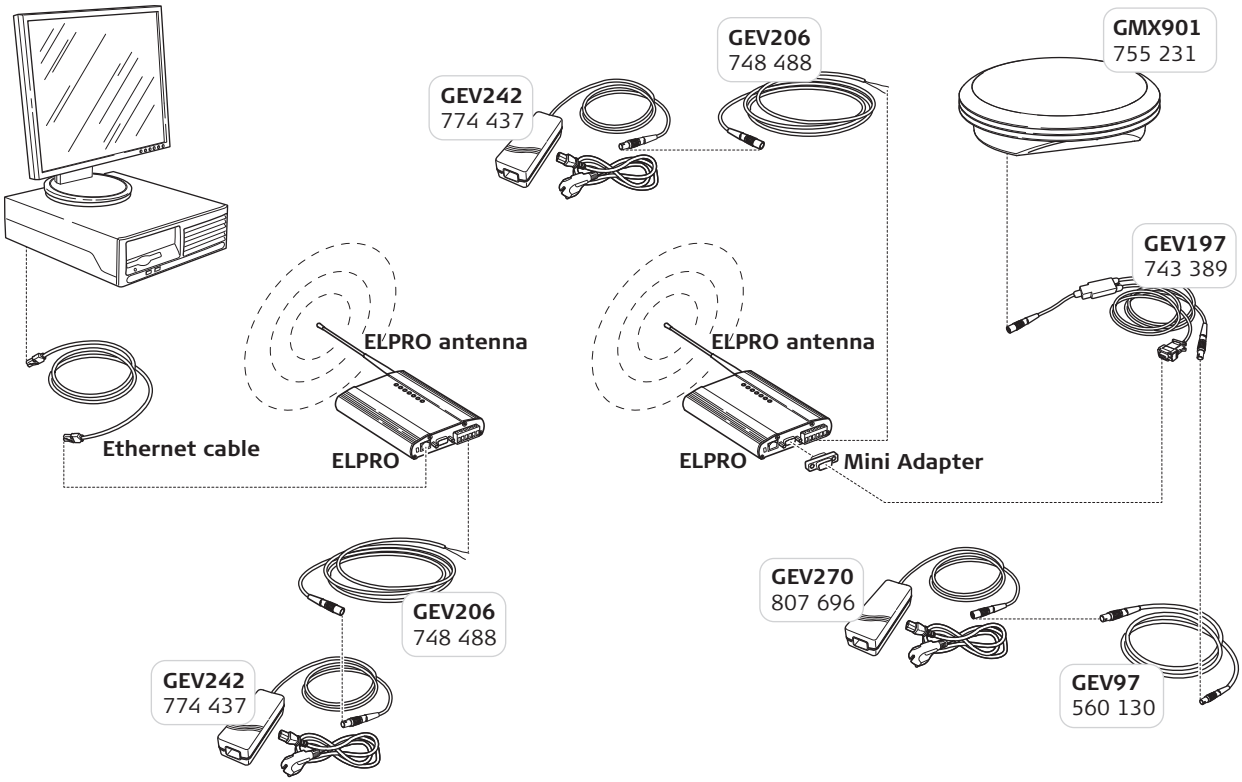
30.1 Total Station with a Wireless Modem (e.g. NB2210)



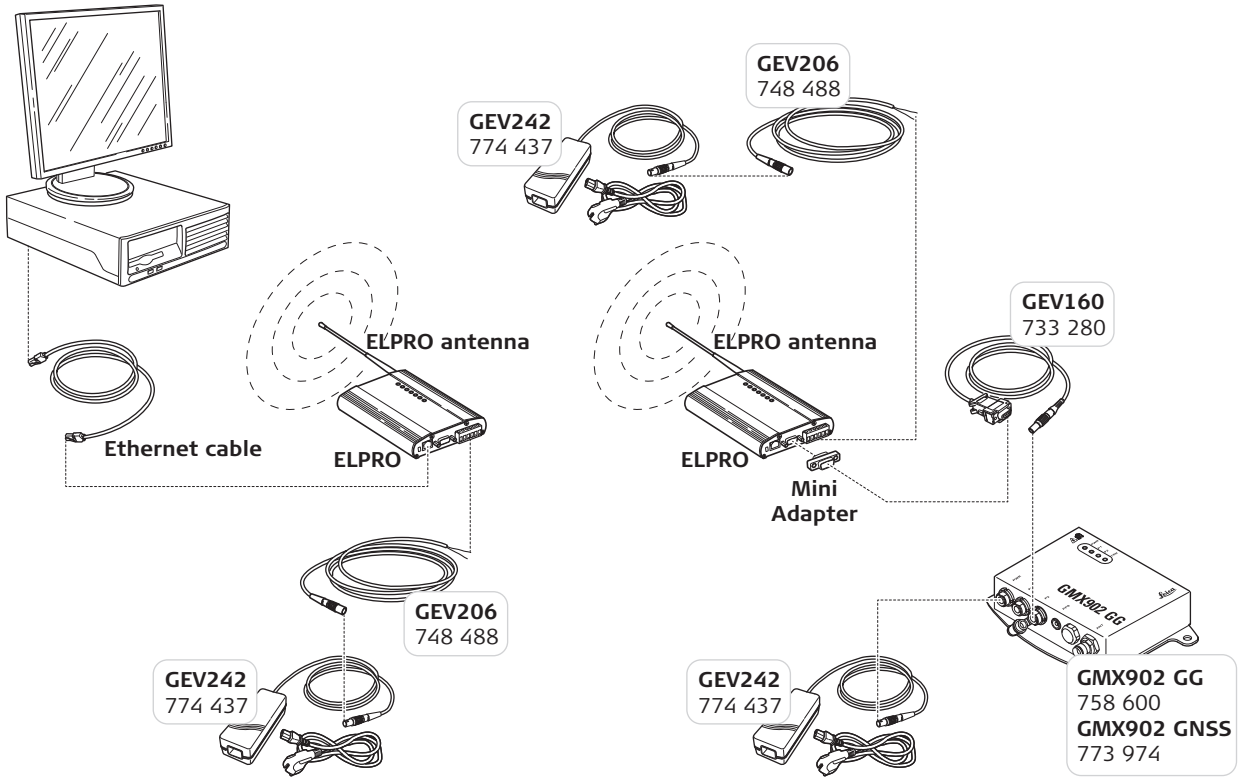
30.2 Total Station with Radio (ELPRO 805U-E)



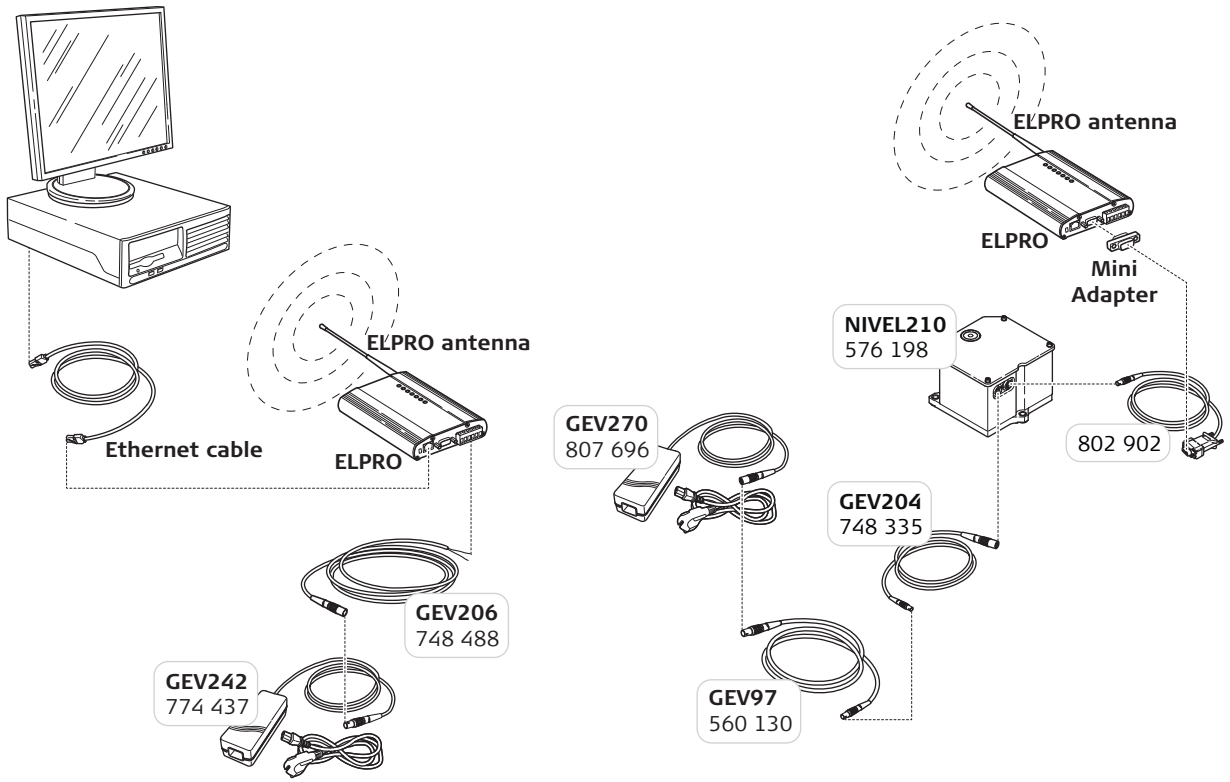
30.3 GMX901 with Radio (ELPRO 805U-E)



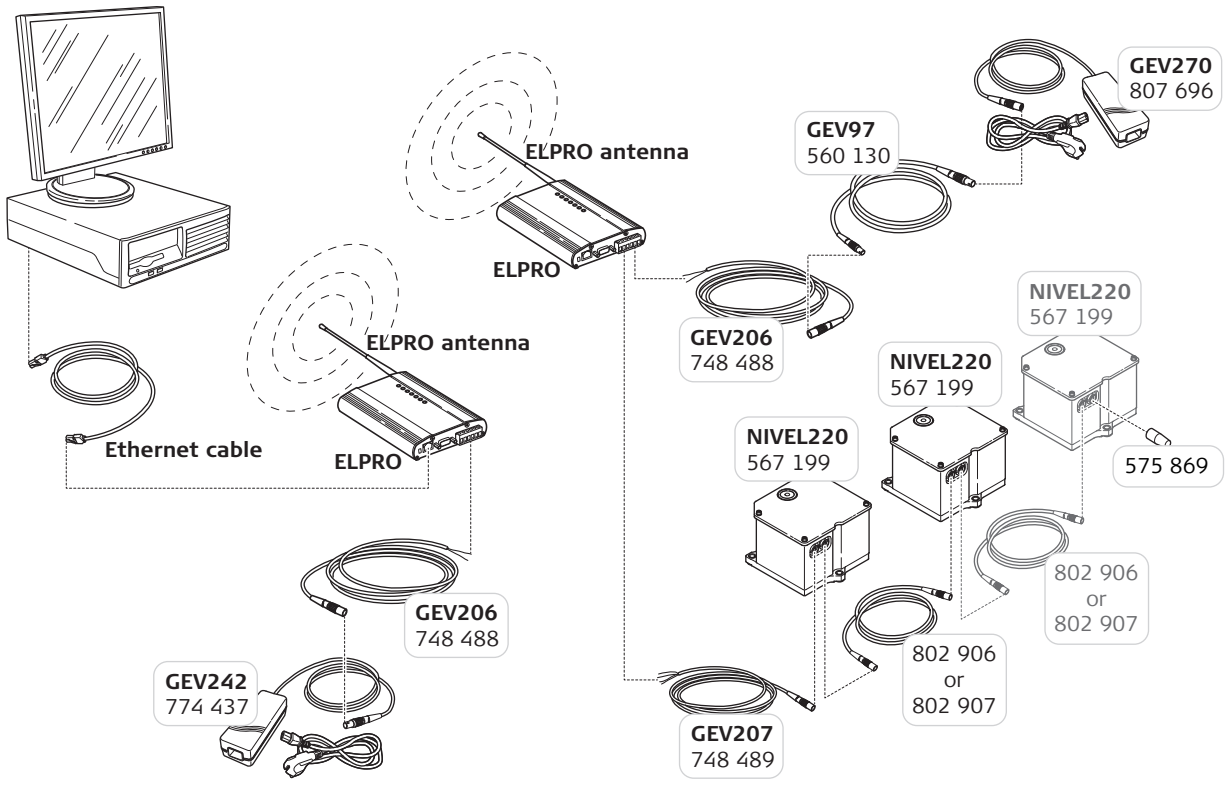
30.4 GMX902 with Radio (ELPRO 805U-E)



30.5 Nivel210 with Radio (ELPRO 805U-E)



30.6 Multiple Nivel220 with Radio (ELPRO 805U-E)



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